





THE
PROGRESS OF CREATION.





Drawn by G. F. Sargent

Engraved by R. S. Squires

"ALL THINGS WERE MADE BY HIM, AND WITHOUT HIM WAS
NOT ANY THING MADE, THAT WAS MADE."

St. John 1: 3.

THE
PROGRESS OF CREATION
CONSIDERED.
with reference to the
PRESENT CONDITION OF THE EARTH.
BY
MARY ROBERTS.



Palm and Tallip. & Trees.

"Lo! higher still the stately Palm Trees rise
Chequering the Clouds."



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WITH REFERENCE TO THE
PRESENT CONDITION OF THE EARTH.

BY

MARY ROBERTS,

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Month in the Year," "Conchologist's Companion;" "Some
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P R E F A C E.

WE learn from the Mosaic record, that the first act of creative power gave existence to the mighty nucleus of our globe, and that, before the revolution of seven days, the herbless granite was clothed with vegetation; moving creatures then passed through the waters, and winged fowl were seen to fly across the heavens; cattle, and creeping things, and beasts of the earth, walked forth in all the vigour of their new existence, and, lastly, man, created in the image of his Maker, had dominion over every living thing.

All then was perfect; but man fell, and with him fell the fresh and beautiful Creation.

My meditations on this subject have led me to pass on to the present condition of the earth,

and to consider its animal and vegetable productions with an especial reference to the benefits which they confer on man. I have further observed their adaptation to different portions of the globe, and how wonderfully the most inhospitable regions are rendered habitable by the location of some peculiar species. Remarkable phenomena on the surface of the earth have been also pointed out; and in so doing I must confess my obligations to the learned author of the *Comparative Estimate of the Mineral and Mosaical Geologies*, and to Cuvier's *Essay on the Theory of the Earth*.

Throughout this volume, I have ever kept in view, that the heavens, and earth were finished, and all the host of them in six days; and that no theory, however plausible, can be admitted in opposition to the Divine Record.

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FIRST DAY OF CREATION.

In the beginning, God created the heaven and the earth.

And the earth was without form and void ; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters.

And God said, Let there be light : and there was light.

And God saw the light, that it was good : and God divided the light from the darkness.

And God called the light Day, and the darkness he called Night. And the evening and the morning were the first day.

GENESIS i. 1—5.

Thus comprehensively, and sublimely, has the sacred historian set before us the history of the first formation of the nucleus of this globe.

It was evidently produced at one moment of that division of eternity, which men call time; this is all that we are taught concerning it, excepting that it was covered

with water and wrapped in darkness; yet there was no intermixture of that water with the particles that composed the hard and solid body beneath; they were distinctly separate, and the water did not remain long enough upon the earth to penetrate far into its substance. The solid nucleus of the globe was, therefore, concealed by the cloak of waters, and total darkness encompassed the mighty covering, so that the mass was barren of all external decoration, and it might consequently be denominated, without form and void.

The first interpreters of the sacred text, the Jews of Alexandria, nearly three hundred years before the Christian era, use the words invisible, or unfurnished, instead of "without form and void." "In the beginning, God created the heavens and the earth, but the earth was invisible." It was also understood in the same sense by the learned Jew Josephus, and thus has he paraphrased it: "In the beginning, God created the heaven and the earth, but the latter not coming into view, but being hidden in profound darkness, was invisible." St. Jerome also, and Grotius, with many eminent biblical scholars, give the same interpretation.

Thus, therefore, was the earth enveloped with thick darkness for a season, till it pleased the Most High, first to render it visible, and then most gloriously to adorn it.

Light sprung up at his commanding word. He divided the light and the darkness, and this completed the first day.

Here, then, commenced the history of time, in its appointed succession of day and night. The Almighty first produced light, which broke in upon the darkness, and these succeeding each other in regular diurnal alternations, showed that the instrumental cause was first put in action.

The sacred historian confines his narrative to effects, but it is for us to refer these effects to their plain and obvious cause. So his ancient Hebrew readers referred them, who needed not to be told that the light of which he spoke, proceeded from the same great solar fountain of light and heat, as that which shone upon their path, though not expressly named, and though the sun and moon were not revealed in their relative functions, as ruling the day and night.

“ Let there be light, and there was light.”

The sublimity of this passage has long been a subject of critical remark and admiration. The more we contemplate the surprising operation, the more will our minds be affected by a sense of that sublimity. The discoveries of Sir William Herschel, tend further to augment the feeling of astonishment, by the distinctness which they impart to our ideas on the subject.

That illustrious astronomer discovered the body of the sun to be an opaque substance, surrounded with a luminous atmosphere. When, therefore, the Most High kindled that splendid atmosphere, its new light was immediately reflected by all the circling planets. Most glorious, then, must have been the first, the sudden and magnificent illumination of the solar system, and well may we imagine what was meant when it was said, “ The morning stars sang together, and all the sons of God shouted for joy.”*

But that great source of light must have been optically non-existent as respects the earth, when covered with water, yet being the cause of heat, it undoubtedly drew up a universal vapour, and was diffused in a manner similar to that which we experience during the prevalence of a dense fog.

* Job xxxviii. 7.

Nevertheless, the bursting forth of light, and the dividing of that light from darkness, the one being called day, the other night, carry with them, in effect, the record of the causes that were ordained to produce them. They inform us, that the solar fountain of light and heat was opened in the heavens on this first day of creation ; that the earth received its rotatory motion on its axis, and in its orbit ; that darkness, therefore, in its relative character of night, commenced from the moment when the earth was created, and day commenced, also, from the moment when light succeeded, at the distance assigned for their division. Hence it was, that in the Hebrew computation of days, darkness preceded light, to commemorate the transactions of the first day.

Some modern speculators being unable to reject the Mosaic records, and wishing to bend them to their own theories, state that the earth rose out of chaos from a confused assemblage of elements, by the laws of nature. They consider that this gradual rising would require a considerable length of time, and they endeavour to obtain it from the sacred text.

But Bacon and Newton were in no such dilemma. They believed the simple fact, and received the words of scripture as Moses intended them. They believed that each day was such as is understood by the common acceptance of the word ; a natural day ; the revolution of twenty-four hours, commencing from one evening, and terminated by the next, according to the reckoning of the most ancient nations.

Johnson, too, in referring to a theory which excited much attention in his time, thus forcibly remarks, " that the number of years which it requires to convert a stratum of lava into vegetable mould, must depend upon the position

of the stratum, and upon circumstances, accidents and temperature, occasional culture, and earthquakes, which admit of no calculation: That farther, it is the most unreasonable of all unreasonable things to call in question the inspired volume, and to throw aside the testimony of, history, for theories, and fancies, resting upon such a basis." The discovery of successive strata of lava and vegetable earth near Vesuvius, had led to the conclusion which excited this remark. And hence arose a theory, that at least twelve thousand years must have elapsed in order to convert a stratum of lava into mould; consequently, that the earth existed at a period antecedent to the one recorded in the Mosaic record. Scarcely, however, had twenty years elapsed, before it was ascertained from authentic records, that the effect had been produced within half a century. Dr. Watson notices this fact in his *Apology for the Bible*. He cites it as a striking instance of the fallacy of geologic theories, which every age produces, and which are successively overthrown. Had Bishop Watson lived to the present day, he would have witnessed the overthrow of nearly twenty systems.

That the period mentioned by Moses was a day, a real rotation of the earth upon its axis, rests not upon a dubious passage. It is six times repeated in the first chapter of *Genesis*; and is thus summed up in the twentieth of *Exodus*. "In six days the Lord made heaven and earth, the sea, and all that in them is, and rested the seventh day: wherefore the Lord blessed the Sabbath day, and hallowed it." Thus carrying down the remembrance of this great act, by a perpetual decree.

We read also in the second of *Genesis*, that even on the seventh day, before man was created, "The Lord God, had not caused it to rain upon the earth; but there went

up a mist from the earth, and watered the whole face of the ground." A mist could not have sustained for ages the exuberance of vegetable life. This we know, because in countries where dew is most abundant, rainy seasons invariably occur ; except in Egypt, and there the rising of the river answers the same purpose.

In the first then, of natural days, the fabric of the globe was formed, and such effects resulted, as were analogous to those which the Most High appointed to result from the new causes then ordained. The earth, wrapped in a watery mantle, became visible, and a glorious lighting up of the whole creation, instantaneously took place. The sons of God saw it, as was observed before, and they rejoiced, and sang together, not only at the wondrous sight, which they beheld, but doubtless at the thought of that innumerable multitude, which should hereafter ascend from off its surface, to rejoice with them, throughout the boundless ages of eternity.

SECOND DAY OF CREATION.

And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters.

And God made the firmament, and divided the waters which were under the firmament, from the waters which were above the firmament : and it was so.

And God called the firmament Heaven. And the evening and the morning were the second day.

GENESIS i. 6—8.

THIS portion implies that the watery vapour which had been gradually exhaled during the preceding day, now formed a canopy above the globe, by the creation of an aërial atmosphere, instead of enveloping it, like a cloak, in immediate contact with the water.

The globe was then disengaged from its incumbent vapour ; but still the effect of light was alone apparent, for a covering of clouds succeeded, and hence the sun could only shed through it, pale and ineffectual beams, yet little

did that signify, for neither men nor animals were then created, nor trees, nor shrubs, only a vast mass, the nucleus of the globe, an hard and solid body, upon which the waters rested.

The cause of that vicissitude of day and night, which so agreeably diversifies our present state, continued, therefore, to be unapparent; but the cause was now in course of perpetual operation; and thus the second day was completed.

THIRD DAY OF CREATION.

And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear. And it was so.

And God called the dry land Earth ; and the gathering together of the waters called he Sea. And God saw that it was good.

And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after its kind, whose seed is in itself upon the earth. And it was so.

And the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind ; and God saw that it was good.

And the evening and the morning were the third day.

GENESIS i. 9—13.

Two wonderful events are now recorded by the Sacred Historian ; the formation of a basin into which the waters might be gathered from off the surface of the earth, and the

consequent appearance of dry land. We read also that the vegetable world was first created, and that the bare and herbless granite was clothed with verdure.

The globe itself having been disengaged on the previous day, from its covering of mist, in consequence of the vapours rapidly ascending into the higher regions of the atmosphere, must have presented the appearance of a vast sea. But suddenly the same Almighty word, which removed the dark mantle that had previously enveloped it, which said, "Let there be light, and there was light," now commanded, "Let the waters be gathered together, into one place, and let the dry land appear, and it was so."

The Sacred Historian, especially directs our attention to the nature of that change, which must have taken place, when the waters suddenly receded, and left uncovered a vast portion of the habitable globe. He leads us to conclude that a part of the earth's surface must have been instantaneously excavated, and that to a depth so great, as to cause the waters to rush with terrible impetuosity into the vast abyss.

It is not for us to say by what means it pleased the Almighty to produce this fearful gulf. We may assume the power of volcanic fires to be one of these. We know that the admission of water to subterraneous fire, occasions volcanic action, and, the fiat of the Most High, which suddenly gave entrance for the incumbent waters, to so great a depth, must have been followed by tremendous explosions.

Thus then, most probably, was formed, that one place into which all the waters under the heavens, were to be gathered together; and thus has the inspired penman commemorated the stupendous fact.

"The waters stood above the mountains. At thy rebuke

(O Lord) they fled; at the voice of thy thunder they hasted away.

“They go up by the mountains; they go down by the valleys unto the place which thou hast founded for them.

“Thou hast set a bound that they may not pass over; that they turn not again to cover the earth.” Ps. civ. 6—9.

That sudden operation by which a vast abyss was opened for the reception of the waters, is here magnificently represented. They fled from the rebuke, and the thunder of the Most High, to a place appointed for their reception; while the borders of that solid portion, which was converted into dry land, are described as a boundary over which they might not repass. The rebuke, the thunder, and the fleeing of the waters, evidently denote a crisis of stupendous and terrific convulsion.

When this great work was finished, when the waters were gone down to their appointed place, and the reserved portion of the earth was exposed to the action of light and air, suddenly sprung forth a new creation. The noble oak, and stately elm, the cocoa, and the palm; trees of all heights, and flowers of all hues, shrubs and grasses, emerged to the sight. All stood forth in their greenness and their beauty, all were so constructed as to maintain a perpetual increase, and succession of vegetable matter; a magnificent garniture of herbs, yielding seeds, and of trees yielding fruit. Meanwhile the atmosphere still continued cloudy.

Thus then arose the flowers that delighted our first parents, the green grass that carpeted the earth, on which they trod; the first created trees from which they gathered their fruit. Those flowers had a stem, and beautifully coloured petals; those grasses, their pliant and graceful stalks; those trees, their trunks and branches, their roots

and leaves; through which the juices were conveyed, to nourish and sustain the different parts.

We observe in the progress of vegetation, that when a tree begins to grow, the ligneous woody folds, which indicate the growth of each year, are soft, or herbaceous, before they acquire the solidity of wood; that the centre ones are uniformly the hardest; while those in the circumference are comparatively tender. The hardness of the folds is, therefore, gradually effected, and in the larger forest trees, years elapse, before they acquire their full growth. A progress is also perceptible before the smallest shrub, or tree, produces fruit. The flower must first be formed, and then emerge from its bud; the petals must open to the sun; the stamens, filaments, and anther must stand in their allotted place; and the pollen duly perform its assigned office. Then comes the ministry of sunbeams, and soft showers, of gentle breezes, or stirring winds, till at length the petals fall away, and the stamens wither, and what was before all fragrance, or all beauty, is succeeded by a ripening fruit, which advances to perfection, either as an apple, or a plum, a cocoa nut, or a plantain. These, independently of their use to man, are designed to produce seed, from which new trees grow up, and thus a succession has been carried on of trees, or herbs, or flowers, from the rapidly unfolded vegetation of the third day, even down to the present time.

But it is evident that none of these processes could have taken place with the first created tree, or herb, or flower. They were suddenly called into being, and none of their component parts, required a progressive course, nor did a hardening take place, from a state of softness or herbaceousness; nor did the flowers open, nor the leaf gradually unroll its wondrous mechanism to the sun. For

then, the fiat of the Creator immediately gave origin to that structure and composition, which has been reproduced in every other vegetable form.

And wonderfully do these vegetable forms show forth the goodness of that Almighty Being, who commanded that the earth should bring forth grass, the herb yielding seed, and the fruit-tree yielding fruit after its kind, whose seed is in itself upon the earth.

Let him, who is disposed to observe the works of nature with reference to their utility, examine the Canadian Birch-wort, which carries at its base two concave leaves; or let him hear that each leaf of the Tilandria or Wild-Pine of the West Indies, is furnished near the stalk with a hollow bucket, containing from half a pint to a quart of water, and he will say, "Surely these plants grow in a land where water is scarce, the thirsty traveller derives refreshment from them: birds also, and some animals have no other supply." The air, too, he would conjecture to be sultry, the country a parched one, and his conjectures would be right. Birch-worts grow in those trembling and frothy-looking Canadian marshes, which dry up during the hot months: their concave leaves receive and retain, for a long time, the showers that fall occasionally, and also the heavy night dews: they are consequently very important to birds, small quadrupeds, and insects, which are thus provided with plentiful supplies of pure and wholesome water, in situations where it can rarely be obtained. The habitat of the Wild Pine is similarly parched, for it abounds in the most sultry parts of the West Indies. Some kinds of Aloes, too, common to parched regions, secrete such a quantity of water in their cup-shaped leaves, as to afford a grateful refreshment for thirsty travellers.

The *Nepenthes Distillatoria*, or Pitcher plant, abounds in those stony and arid parts of Java, from which small birds and quadrupeds must migrate in search of water, were it not for this vegetable production. The traveller, who passes through those sultry regions, is frequently attracted by its singular appearance, and by the number of birds, that fly in and out among the branches. On drawing near, he observes a small bag, shaped like a pitcher at the foot stalk of each leaf, furnished with a neatly fitted lid, and having a kind of hinge that passes over the handle of the pitcher, and connects it with the leaf. This hinge is a strong fibre, which contracts in showery weather, and when the dew falls. Numerous little goblets, filled with sweet fresh water are thus held forth, and afford a delightful draught to such small animals, as climb the branches, and to a variety of winged creatures. They hear the pattering of the heavy rain-drops, on the dry leaves, while sheltered in their hiding-places, and when the rain is sufficiently abated, forth they come, and refresh themselves at every open cup. It is delightful to see them thus employed, and the pitcher plant is sometimes almost covered with these thirsty creatures: some drinking eagerly, others lifting up their little bills between each sip, as if grateful for the refreshing draught. But no sooner has the cloud passed by, and the warm sun shone forth, than the heated fibre begins to expand, and closes the goblet so firmly, as even to prevent evaporation. This is a beautiful, and prospective contrivance. The quadruped, bird, or insect, has had sufficient time to quench its thirst, for the heavens do not immediately become clear, and when the goblet is filled with dew, some time must necessarily elapse before the warmth of the sun is felt. But the plant also requires refreshment; rain drops



THE PITCHER PLANT.

soon trickle from the arid place, in which it grows, and the nightly dews are insufficient to refresh the sloping side of its assigned locality. The pitchers, therefore, are essential to its preservation, and a sufficient quantity of fluid is preserved by the gradual contraction of the lid. As long, too, as the lid stands open, the slender bill, the proboscis, or the tongue can be readily thrust in, but as it gradually contracts, this is of course precluded; but, then, lest any poor thirsty creature should arrive late, or remain unsatisfied in the crowd, such pitchers, as are covered with leaves, remain much longer open, and it is probable that some never close at all. We may also remark that neither one, nor two, nor even ten large pitchers are assigned to each plant, but that every leaf-stalk has its own. Hence every leaf receives a necessary supply of moisture through tubes that communicate, like syphons, with its absorbing vessels. I scarcely know a single instance in which a wonderful adaptation of one part to another; of one vegetable to the animals that surround it, is more clearly evinced than in this unassuming plant.

Now if the leaves were broad like those of the common chesnut, or the coltsfoot, neither rain, nor dew could reach the pitchers: but instead of this, they slope upwards: therefore when the lid is open, the pitcher soon fills, and to its brimming goblet innumerable winged creatures eagerly resort. The insect has a long proboscis, with which to sip up the moisture; the bird introduces its narrow bill; but if the insect or bird had instead of these, mouths constructed like a fish, and those peculiar tongues, which distinguish aquatic natures, considerable difficulty would arise, and the pitcher be often broken in the endeavour to procure a sip. We may also fairly assume that the little quadrupeds, which resort thither, are furnished

with a long and slender member, which permits them to lap the water, through comparatively a narrow aperture. And as the claws of birds enable them to retain a firm hold on branches, when even rudely shaken by the wind ; and the feet of insects are so formed as to grasp the smoothest stems ; many little animals have likewise feet well adapted for climbing. The field mouse, for instance, which can run up a stack of corn ; and all swift moving, and defenceless quadrupeds are thus constructed. The digging foot which is assigned to the mole, or one resembling an horse's hoof, would be useless in ascending slippery places. The pitcher at each leaf-stalk has also a twofold purpose ; it refreshes the parent plant, and holds forth an open goblet to many a poor thirsty way-faring creature. A few would not suffice either to the plant or its visitors, as I before observed, and, therefore, every leaf is similarly provided : nor is it less worthy of remark, that if the fibrous hinge contracted only in heavy rain, such birds, and quadrupeds, and insects as fly or walk by night, would not be able to quench their thirst ; but dew equally affects it ; therefore it is for them also that the nightly goblet is thus bountifully replenished. And how multifarious are its uses, whether filled by rain or dew ! Without the moisture which it thus retains, the beautiful green colour that adorns the plant would fade ; the flower could not open, the seeds could not ripen, such creatures as subsist on the sweet nectarious juices of its open flowers would lose their daily banquet, and numerous small birds and quadrupeds must drag on a miserable existence, if, indeed, they could exist at all. These wants are admirably supplied, and who does not acknowledge, in the pitcher-plant of Java, the same beneficence which was assigned as one reason for sparing Nineveh, that it contained much cattle ?—

“ Which charg’d the Jew
T’ assist his foe’s down-fallen beast to rise ;
And when the bush-exploring boy, that seiz’d
The young, to let the parent bird go free,
Prov’d he not plainly that his meaner works
Are yet his care, and have an interest all,
All in the universal Father’s love.”

COWPER.

Place the pitcher plant beside our running streams, and it would seem to have been made in vain ; cause those streamlets to break forth in its place of growth, and the pitcher plant, with all its exquisite contrivances, would be unnecessary. Surely the whole earth is filled with the goodness of Jehovah ; and O, that men would praise him for the proofs of wisdom, and beneficence, which are thus scattered abroad !

The *Ledum Palustre* of Labrador, also, affords a striking instance of the same beautiful economy. The leaves are spoon-shaped, and inverted with the concave side turned towards heaven ; consequently, when it rains they are filled with water, and afford a liberal supply to birds and winged insects. The refreshment of the plant, and the support of such thirsty creatures as dwell, or fly in its vicinity, seem to comprise the twofold purpose, for which the spoon-shaped leaves are designed. The pitcher-shaped bag answers the same end, but by complicated means ; and care is evidently taken to retain a larger share of fluid for the nourishment of the plant. A botanist, therefore, who knew nothing of Japan, and had never visited Labrador, might safely infer from the construction of the plants, that the nature of their soil and climate was widely different ; that in one, water was more scarce than in the other ; and that, consequently, birds of desultory flight, and small tender-footed quadrupeds, found it

more difficult to quench their thirst in Japan than Labrador.

And here let me pause for a moment to observe, that the acquisition of science opens a continual source of delight to the well-conducted mind. He, who knows nothing of the wonders that surround him, may be charmed with the beauty, or the fragrance of a flower, but he cannot comprehend the secret delight, that springs within the breast of one, who regards the whole with a botanic eye: who can look upon a flower, and understand the admirable fitness of its parts, who knows something of its exquisite mechanism; by what secret tubes the plant is nourished; in what way the sap ascends, and why it is that the leaf or flowers turn towards the light! Take, for instance, the red currant, which grows in every cottage garden. It is a pleasing shrub, much to be admired for the light green of its elegant leaf, its pendant flower, and graceful fruit. The botanist sees all this; but he sees something more, which may well fill his heart with gratitude, and teach him that science is the gift of God, and should be devoted solely to his glory. The botanist knows that the insertion of the stamina into the calyx, as in the class icosandria, indicates a wholesome fruit; but that the fruits of the class pentandria monogynia, to which the currant belongs, are dangerous; and many of them fatal. Yet the currant is an exception, and this is indicated by the insertion of its stamina, in which, though not in their number, it accords with the icosandria. By attending to this simple fact, a traveller, in an unknown country, may safely eat its native fruits.

But to return from this digression. As the need increases, so do the means to supply that need. The burning sands of Africa exhibit a large tree, called by the



RAINING TREE OF THE CANARY ISLANDS.

negroes Boa. The trunk of this is a natural reservoir for water during the rainy months, and being shaded with thick foliage, continues fresh and cool during the heat of summer. Travellers are often saved by the knowledge of this extraordinary fact, from perishing with thirst in crossing those sultry deserts, where, during six long months, not a single shower refreshes the parched earth. Vegetable fountains also rise on the arid rocks of the Antilles. They are called Water Liannes, and are so full of sap, that if a single branch is cut, a quantity of pure liquor immediately exudes.

How wonderful is the Raining-tree of the Canaries, which affords a regular supply of water to an island which is destitute of so great a blessing. A mist arises every morning from the sea, which rests on the thick leaves, and widely-spreading branches of a kind of laurel, and then distils in drops during the remainder of the day, till it is at length exhausted. The peculiar situation of the tree enables it more readily to attract the mist; for it springs from a rock, at the termination of a long and narrow valley. This interesting tree is an evergreen, of considerable size. The water which distills from it, furnishes every family in its vicinity, with what is sufficient for domestic purposes, and persons are appointed by the Council to distribute the necessary supplies.

Observe, too, the peculiar character of the swamps, that extend along the bay of Campeachy. The name swamp seems to indicate the presence of water, and this is correct, during the winter months; but when the heat of summer is set in, the swamps dry up, and no running stream is heard throughout the vast extent of their almost interminable forests. Yet these forests must be traversed during the hot months, and those who traverse them often

lose their way, and would perish were they not provided with living fountains in that hot land. A peculiar kind of fungus, called the pine-apple fungus, from its resemblance to that fruit, grows profusely on the trunks and branches of a native fir. These fungi are so full of sap, that, on being cut with a knife, nearly a pint of clear and wholesome juice immediately flows out. We may infer that the animals and birds, which frequent these deep forests, are instructed to avail themselves of the valuable supply, for every created thing serves at least a twofold purpose: it ministers either directly or indirectly to the wants of man, and answers many important ends, in the great economy of nature.

But it is not for man alone that vegetable fountains rise in arid places. We must again refer to the wonderful provision, that is made for the many living creatures, which are called into being, and which are not suffered to perish with thirst in their wilderness-abodes. Carry your eye, my reader, towards the sultry deserts of Africa, where no cool breezes refresh the weary traveller, and no sound of running water is heard, where the heavens are unclouded, and the sun blazes with meridian splendour; where it often happens that for six long months, no water-urns of the firmament (as Arabian writers beautifully denominate the passing clouds,) moisten the parched earth. It seems impossible that either animal or vegetable life can subsist on such a burning and sandy soil, and yet there is a class of vegetables, and certain small animals that live there, which are admirably adapted to resist the effect of temperature and soil. Campbell mentions, that while crossing one of these burning plains, he remarked several creeping plants of luxuriant vegetation. Now it is well known, that the plants of Africa have generally

succulent leaves, like those of the aloe and mesembryanthemum, and that the sap-vessels are very large; this may easily be observed by holding a leaf to the light, when they appear like tubes open at each end, and are thus enabled to absorb any atmospheric moisture. Dews fall heavily in those hot countries, and the plant is thus preserved in health and vigour. But the plant does not exist for itself only; the moisture thus secreted is given out for the benefit of others: it is either covered with large juicy berries, or the superabundant moisture distils from off the leaves. But the first most generally occurs, and the berries, which thus grow upon the stem or leaves, are filled with a clear transparent fluid, as essential to the well-being of the aborigines of those intolerable regions, as the cocoa-nut is to the inhabitants of the torrid zone. A small quadruped, resembling a mouse, abounds on the sand-hills, and these creatures were seen busily employed in nibbling off the berries, and carrying them to their holes, as seamen convey casks of water into their ships. Here is a real benefit conferred, and no doubt these little quadrupeds are of use, for we may certainly infer that no creature is placed without design in its allotted station. It may also be conjectured, that they are admirably adapted for the kind of life, to which Providence assigns them; for we cannot admit, that as these vegetables are furnished with large sap-vessels for absorbing moisture, and with others, through which the moisture distils into little berries, and all this expressly for preserving life in those small quadrupeds; that the quadruped itself has no purpose to fulfil. We may also briefly notice, how well the little animal is provided with teeth for nibbling off the berries. If the teeth were flat, or hook-shaped, as fre-

quently occurs, the berries would in vain offer a refreshing draught to the thirsty quadruped ; again, the quadruped draws out the superabundant moisture from the sand-plant, which is admirably furnished with large absorbing vessels, for the express purpose of drinking in the dew. Neither the plant, nor animal can minister to the dew ; and from this we may gain instruction :—that gracious Being, whose silent operations are compared to the dew, which falls unseen, and yet refreshes the thirsty plant, derives no benefit from the mercy he imparts. He delights to bless his creatures, and in blessing to increase their happiness.

Now if the aloes, of which I have just spoken, grew in England instead of Africa, in a country where rain often falls, and the weather continues cloudy, their thick leaves would be unnecessary, for no animal requires a vegetable fountain in this land of running streams ; hence the aloe never grows wild in England, and even the few English vegetables, which in any respect resemble it, flourish on rocks and walls, and their juicy tubes secrete a liquid which is invaluable in medicine.

Such are the water plants which supersede the necessity of streams in countries, where the existence of such streams, is incompatible with the general arrangement.

The *Zamia horrida* is also one of those extraordinary plants, of which the use cannot be otherwise than obvious.

The root, in a specimen we have lately seen at the Chelsea Botanical Gardens, is about the size of a quartern loaf. It grows at least three parts out of the ground, and retains its hold by means of fibres, that start from the base. A multitude of branches rise immediately from the top of this strange root, some straight, others horizontal, but none ever drooping ; they are covered with stiff

thorns, whence the name of *horrida*, all of which are halbert-shaped, extremely sharp, and of a dull green colour. The *zamia* grows in India, in such parts, especially, as abound with small timid animals, and large wild fowls, which glide beneath the branches, when pursued by savage animals, or rapacious birds. Now if the branches drooped, this would be impossible; if they grew out of the ground, no creature could press through them; but the Creator, who evidently designed the *zamia* as a safe resting-place to those whose fleetness is their only protection, causes the under branches to grow horizontally, and places the greatest portion of the root above the earth. The *zamia*, too, like our own furze-bush, grows best in company with its kind, and hence many acres are sometimes covered with this wonderful production; when, therefore, the lion's roar is heard, or the deep growl of the tiger, or the scream of birds of prey, away scour the timid quadrupeds and birds, to hide beneath the branches, and there they are safe, for not even the lion, or rhinoceros, will make a charge upon this formidable plant.

There are, also, other plants, that wonderfully counteract the deficiencies of soil and climate, in the places where they grow. We shall notice some, that tend especially to the comfort of civilised life.

The Cow Tree has recently been discovered in one of the most unfruitful regions of South America, in a country but little calculated for the pasturage of cattle. It grows with dry and coriaceous leaves, on the steep side of a rock, and its large woody roots can hardly find sufficient depth of soil wherein to fix themselves. For several months not a single shower moistens its deep foliage; but the pores are so constructed as readily to imbibe the

heavy dews that fall nightly in hot countries: the tree is, consequently, preserved from perishing, though its branches sometimes appear dead, and the leaves look dry and withered. But when the trunk is pierced, a sweet and nourishing milk flows out, which is always most abundant at sunrising. He who is then abroad, may see a crowd of blacks, and natives, hastening from all quarters, and carrying large bowls to receive the milk; some drink from the bowls beneath the tree, others carry the juice home to their children. What a wonderful provision! The cow-tree does not grow in the burning deserts of Africa, and why? Because the camel traverses them, and its rich abundant milk supplies the wandering Arabs, that pitch their tents upon the burning soil. But the camel is not found in South America; and in the region of the cow-tree, there is neither pasturage nor cattle. A tree is, therefore, stationed in that arid region, which abundantly supplies the wants of the inhabitants. Old and feeble persons are provided with a nutritious beverage, and little infants are nourished with pure milk.

The Shea, or Butter Tree of Africa, affords another instance of that protecting care, which abundantly supplies the wants of man. It grows in the wooded country round Ashantee, and Kabba, and resembles an American oak, while its fruit is like the Spanish olive. Butter, in this country, though a grateful addition, is not an absolute necessary of life; but in the native regions of its vegetable prototype, where there is little variety, it forms not only a pleasant but nutritious viand, and is much firmer, as well as superior in flavour, to that produced from milk. Salt is not essential to its preservation, in even that hot country; and salt, perhaps, could not easily

be obtained ; vegetable butter, therefore, never becomes rancid, but it will keep even through the year.

Now look to that vast extent of country, the native regions of the Cocos, which include a considerable part of South America, of Africa, and both the Indies. By this single production of the vegetable world, what incalculable blessings are bestowed on man. It almost supercedes the necessity for much exertion in those torrid lands, where manual labour is sometimes paralysed by the oppression of the climate. This noble tree rises like a stately column to thirty or forty feet in height ; it is crowned with a verdant capital of waving branches, and surmounted with long spiral leaves, beneath which, tufts of blossoms, and clusters of green or ripened nuts, appear in mingled beauty. These nuts contain a delicious juice, and the kernels, when dried, afford abundance of oil ; the remainder is used for feeding cattle, and poultry, and for manure. The shell is also employed for cups and ladles, and the enclosing husk is invaluable to the natives of the East. It is manufactured into ropes and cordage of every description, from small twine to the largest cables, which are far more durable than those of hemp. The leaves that canopy the head, make, when platted together, excellent thatch, coarse mats for cottage floors, common umbrellas, and brooms ; while the finer fibres are woven into beautiful mats for the apartments of the rich. The trunk, too, though porous, furnishes beams and rafters for dwelling-houses. Nor is this all. The extraordinary arrangement of the fibres, which form its bark, evidently gave rise to the art of weaving. As the tree increases in size and age, this bark appears like regular woven coarse bagging, and comes loose from the trunk. We owe the

knowledge of this curious fact to Captain Riley's Narrative of the loss of the American Brig Commerce, and his subsequent captivity in the Great Desert. He tells us, that the primitive mode of making cloth is retained by the Arabs, that women are employed in its construction, and that when they have spun a sufficient quantity of threads, they drive into the ground two rows of pegs in parallel lines, wrap the yarn around them, and commence weaving by a kind of wooden sword, run through the yarn under one thread, and over another, in the manner of darning. This sword they carry with them; and to Captain Riley it seemed as if it had been used for ages. The cloth, when finished, closely resembles the outer bark of the cocoa tree, which is, indeed, frequently employed, as clothing, by the natives of Africa.

All that is essential to the wants of man, is, therefore, comprised in the cocoa-tree. In proof of this we may observe, that the inhabitants of the Nicobar islands build their vessels, make the sails and cordage, supply themselves with provisions, and other necessities, provide a cargo of arrack, vinegar, oil, and coarse sugar, cocoanuts, cordage, and black paint, with several inferior articles for foreign markets, from the multifarious productions of this valuable tree.

“Lo! higher still the stately Palm-trees* rise,
Chequering the clouds with their unbending stems,
And o'er the clouds, amid the dark blue skies,
Lifting their rich unfading diadems.
How calm and placidly they rest
Upon the heaven's indulgent breast.
As if their branches never breeze had known!
Light bathes them, aye, in glancing showers,
And silence mid their lofty bowers
Sits on her moveless throne.”—*Isle of Palms.*

* Phoenix, or Date Tree.

These vegetable columns are often seen in the vast deserts of the Zaara, rising to the height of, perhaps, one hundred feet. They comprise within themselves almost every thing that is essential to the wants of man : fruit ; a sweet mucilaginous juice resembling milk ; honey from the dates ; and a grateful food for the sheep and camels, by steeping the stones in water. It is even said that from one variety of the Palm Tree, the *phœnix farinifera*, a meal has been extracted, which is found among the fibres of the stem. The trunk is employed for fuel, a spirituous liquor is prepared from the sap ; the fibres of the boughs furnish threads, ropes, and rigging ; the leaves are used for brushes, for mats and bags, for baskets and couches, and as fans for chasing away the troublesome insects that infest hot countries ; the branches, too, are employed in making cages for poultry, and garden fences. But the phœnix is a lofty tree, and its vegetable treasures, its leaves, and fruit, grow at a great height. To obtain them, would, therefore, be extremely difficult ; the tribes which inhabit the wild deserts of Barbary, know little of modern inventions, and even if they did, the carrying of a ladder to any considerable distance would be inconvenient, if not impossible ; but the difficulty is provided for, and the phœnix, notwithstanding its great height, may be ascended as readily as a step-ladder. The trunk is full of cavities, vestiges of decayed leaves, which have within them a flat surface, exactly adapted for the reception of the hands and feet. The natives, therefore, run nimbly up the towering phœnix, and even boys and women are not afraid to venture.

This noble tree attains its greatest perfection in the vast deserts of Sahara, and in Arabia, because there its presence is essential. Wandering tribes frequent the

extensive precincts of these deserts, and scarcely anything will grow there, except occasionally a few solitary patches of maize. Exposed to a burning sun, and sometimes covered with drifts of sand, vegetation proceeds slowly, even on the borders of the desert, and the hopes of the husbandman are frequently disappointed. Without this valuable tree, man might indeed exist, because the camel would suffice for every actual want; but how could the camel be supported? Provender will sometimes fail, and then, as I have before observed, the stones of the fruit, when steeped in water, support both men and camels in long journeys across the desert. To those, too, who lead a settled life upon its borders, beside their palm groves, and are within reach of water, these noble trees supply every needful want; and on those great wastes of sand, that are never trodden, except by the wandering steps of predatory Arabs, the palm-tree stands majestic and alone, a storehouse richly supplied with all that is essential to their wants. It not only yields a salutary food for both men and cattle, but uniformly indicates fresh water near the roots. Groves of palms are often seen like beacons, in the midst of sultry deserts; and beneath their umbrageous canopy, the fainting traveler may find a shelter in the noon-day heat. Some of these are very ancient. That of Elim yet remains, and its twelve fountains, have neither increased, nor diminished in number, since the days of Moses.

The poor inhabitants of Egypt, Arabia, and Persia, subsist almost entirely on dates; and hence it was, that when Egypt was given into the hands of Nebuchadnezzar, king of Babylon, the conquest was principally effected by the destruction of the numerous date forests, with which it abounded. "Behold," said the Prophet Jere-

miah, "they shall march an army, and come against her with axes, as hewers of wood. They shall cut down her forests, saith the Lord, though it cannot be searched, because they are more than the grasshoppers, and are innumerable."* The French, under Buonaparte, were preparing to adopt the same policy, when the people, being apprehensive of utter ruin, immediately laid down their arms.

Much is here comprised in one vegetable production, that in Europe is effected by the skill and industry of man, in deriving what is essential to his wants, from various natural productions, and these frequently far distant, and requiring in their cultivation both care and knowledge. If the palm-tree was consigned to our favoured region, innumerable hands might remain unemployed: those energies which are now directed to works of utility, might be wasted in idleness, or banefully employed; for man is an active creature, and the idle hand is often turned against a brother of the species. Now observe a few among those innumerable animals and vegetables, that are employed in Europe to supply our wants, and how simply, yet how completely, the same purpose is effected in a different climate by the stately phoenix. Milk is the produce of our herds; the keeping of them is necessarily attended with expense. Grasses must be sown for their use; the selling of these is the business of the seedsman; and the planting and mowing, the making of them into hay, when mown, and the thatching of the rick, in order to preserve them from the wet, furnishes occupation to innumerable hands. The date-tree would supersede all these; for a sweet mucilaginous juice, re-

* Jer. xlv. 22, 23.

sembling milk, plentifully exudes from the excavated stem.

Meal, too, is the produce of corn, and, in the preparation of it, how many are employed ! The field must be ploughed, the seed-corn sown, stones picked off, and weeds rooted up ; rains also must descend to foster it, and the winds must blow, the sun shine bright, and the beautiful harvest moon ripen the corn. Then come the reapers' pleasant toil, the waggon constructed of wood and iron, and teams of horses to carry off the loaded grain ; the barn in which it is deposited, with walls of stone, and slated roof, and glazed windows ; the thresher, the mealman, and the baker. All these are generally put in requisition before a single loaf of bread is placed upon the table. But the palm-tree supersedes the corn, the waggon and the barn, the thresher and the mealman. It contains within its ample storehouse, meal, as good as that obtained from wheat.

Honey is in this country equally wholesome and agreeable. Bees, we know, produce it ; but bees must be hived, and their hives are an article of trade ; they are made from straw, and the making of them employs many hands ; the selling of wax and honey many more. And how wonderfully is the bee constructed to answer these important purposes ! The proboscis, and the honey-bag, the instinct which impels the little rover to the field or garden in search of food, are all adapted to the same end. The flowers, too, how admirably are they made ; they are furnished with nectaries, and secrete a sweet juice ; they are often so arranged as to supply resting places for the little feet, while the industrious bee collects the yellow dust from off the anthers, and forms it into pellets for her combs. The best honey is generally produced from wild

thyme: and here it is worthy of remark, that herbivorous animals attach themselves to the leaves of grass, leaving untouched the stalks that support the flowers. How wonderfully is the preservation of every living thing provided for! What a beautiful arrangement, and consistency is observable throughout the whole creation! If sheep, in pasturing, preferred the flower to the leaf, what would become of the industrious bee? The humming she makes, by the quick vibration of her wings, in collecting her summer harvest, would be over, there would be no sound of bees about the hive. Seeds must also fail, and our verdant meadows, unrenewed from one season to another, would often be covered with weeds. "The flocks would be cut off from the fold, there would be no herd in the stalls;" and as the fields could yield no meat, how could man be clothed and fed? Thus are the support and well-being of society, in a great degree, dependant on the strict observance of that one law, to which the Creator has subjected all herbivorous animals.

We may also briefly notice, that the profits arising from a range of bee-hives, often pay the rent of an industrious cottager; and that wax is used for many important purposes.

The phœnix would supersede the bee; for honey is procured from its dates. In the making of our couches, baskets, mats, bags, and brushes, what a variety of materials are required! Think of what enters into the composition of one of these: of the wire, the wood, and paint that is necessary even for a bird-cage. All these materials, one solitary tree, the palm, affords.

Threads, ropes, and rigging, employ in their construction innumerable hands; the materials for making them,

come frequently from a distance, and then both ship-builders and sailors find employment, and the manufacture of cables and sails is a considerable and lucrative branch of commerce. All these are comprised in the date-tree.

Now if this noble tree had grown plentifully in the British isles, innumerable hands would have been unemployed, and many curious and beautiful inventions might never have been elicited ; whereas in the arid regions, to which it is mercifully assigned, none of those plants, and animals, could exist, which in this country call forth the energies and ingenuity of man.

Herds cannot be sustained in sandy deserts, grass will not grow there, nor is iron the production of the earth there ; and if it was, the intolerable heat of a burning sun would render the smelting impossible. The industrious bee could not exist upon the deserts ; there is neither rock nor tree to afford her a shelter, nor pleasant flowers yielding wax and honey, nor straw with which to form her hive. None of the various productions, of which couches, mats, and baskets, bags, brushes, or garden-fences are made, could grow in a torrid clime ; nor are there any rivers, down which a gallant vessel with oars might pass, nor ships to bring home the hemp, and wire, the soap, and pitch of other lands. Neither if there were, could manufactories be set up, from the want of wood and iron, or men be found to labour hard in a sultry and intolerable clime. Every needful want is, therefore, abundantly supplied by the phœnix, and in speaking of it, we refer to the vast deserts of Arabia and Sahara.

Thus it is evident, that the productions of the temperate zone could neither exist, nor be appropriated

among tracts of burning sand ; and that if the palm-tree of the East was to spring up in our fields, trade, commerce, and industry, would simultaneously languish, and a variety of plants and animals seem to be made in vain.

Now turn from the glowing regions of the Line, to Kamtschatka, that barren and inhospitable land, incumbered with unwholesome marshes, and impenetrable thickets, where, during nine long months, snow lies thick upon the ground. Corn, consequently, cannot grow there ; but, instead of this, the most fertile spots are luxuriantly covered during summer with Sarenne. The roots of this valuable plant are gathered by the women in August, when they are dried in the sun, and laid up for winter use : they make excellent bread, and when baked, and reduced to powder, serve instead of flour in various dishes. They are also very nutritious, and are often washed and dressed like potatoes. This plant is evidently a provision for the Kamtschatkadales, and answers the same purpose in those regions, as our own rich fields of waving corn in these more favoured climates. But there are two parts connected with the sarenne, that may well detain us a few minutes. When the migratory species of fish, which annually visit in innumerable multitudes the sea and rivers of Kamtschatka, become scarce, the sarenne is plentiful ; when, on the contrary, this valuable plant begins to fail, the rivers are full of fish. The economic mouse, also, is a valuable coadjutor. This little animal principally lives upon the roots of the sarenne, which it not only collects at the proper season, and lays up in magazines for winter store, but also occasionally brings out, and spreads upon the ground in sunny weather, as if careful to preserve them from the danger of decay. The natives search for these hoards,

and after plundering the little citadel, prudently leave part of the magazine for the inhabitants, being unwilling that such useful animals should perish during the winter. Here, then, are the soil and climate of Kamtschatka, the sarenne that grows along the banks, the fish that frequent the rivers, the economic mouse, and the long winter nights, all beautifully harmonizing with one another ; all so constructed as to remedy the deficiencies of the country.

The Birch, too, how admirably is it adapted to the icy regions of the Arctic Pole, where the benefits that it confers are equally important with the cocoa-nut-tree of the South-Sea islanders, or the date-tree of the wandering Bedouins ! The Birch is a native of Europe ; it extends from Lapland to the subalpine parts of Italy, and is found in Asia, on mountains and high windy places. This valuable tree furnishes to the natives of those remote, and often sterile regions, all that their necessities require. To the Laplanders it yields a plentiful supply of fuel for their fires ; and when covered with the skin of the rein-deer it forms their beds. They also convert the inner bark into hats and caps ; and the fragments, when dexterously braided, are made into shoes and baskets, and outer garments to keep off the rain. The Norwegians use it for tanning hides, for fishing-nets, and sails ; and as the outer bark does not decay in even the dampest places, it is employed for covering the roofs of houses, when laid upon a quantity of turf about three or four inches thick. They further dry and mix it up with meal, for the winter food of cattle. With the Highlanders of Scotland, the bark is in great request for making ropes and tanning leather, and they often burn the outer rind instead of candles.

Nor less important is this graceful tree to the In-

dians of North America. They make from it canoes and boxes, buckets, kettles, baskets, and dishes, which they ingeniously join with threads of cedar roots: also an excellent kind of touchwood, invaluable to them in hunting, and elegant little vessels; these they rib with white cedar, and cover with large flakes of the birch bark, sewed together with threads of spruce roots, and carefully pitched over. To this purpose the birch-tree was anciently applied, even in Britain, where it served for fuel. Large birch-trees are found, occasionally, in many of the mosses of Yorkshire. They most probably have remained there for ages, and when taken out they burn like fir and candle wood. A kind of bitumen may also be extracted from the birch, and the inner white cuticle and silken bark, which annually falls off, may be used for writing upon, as was formerly the case before the invention of printing. The outward and coarser bark is employed instead of slate, for the covering of houses in many parts of Russia, Poland, and other northern tracts; and in Sweden the bark, when ground, is mixed with bread-corn. A wholesome wine is extracted from the wood, by the inhabitants of Kamtschatka, and with the light and durable bark they construct sledges and canoes.

Chesnut Trees, on the contrary, flourish best among the stony mountains of southern Europe, where they supply the want of corn. They are found in great perfection on the island of Corsica, and the fruit, about the size of a pullet's egg, is much used by the inhabitants. Stately trees also decorate the ridges of Mount Etna; and one of these, the Centum Cavallo, is the greatest wonder in Europe; its foliage is so extensive that an hundred persons have been sheltered under its ample branches. The same mountain also exhibits ano-

ther specimen of such a noble size, that the neighbouring shepherds often pen their sheep within its ample trunk, which is hollowed by time. The sturdy roots of the chesnut-tree penetrate to a great depth, and will even force their way through beds of lava, in order to reach the streams beneath : they are, in consequence, often seen to spring from out the ridgy sides of rocks, and in dry sandy places, where apparently trees of such magnitude and foliage could not grow.

We may also briefly notice a solitary plant, which is invaluable to the wandering Arab, and his "mute companion." This is the Camels' Thorn, a bitter shrub, which beautifully exemplifies the merciful care of Providence. Its everlasting verdure refreshes the eye of the traveller, and its deep-searching tough roots collect the scanty moisture of these arid plains. This property the Arab applies to the production of a grateful and necessary refreshment. He removes a little of the sand, and having made an incision in the stem, as near the root as possible, he inserts a single seed of the water-melon in the fissure, and then carefully replaces the sand. The seed becomes a parasite plant, and the nutriment, which the brittle succulent root of the melon would be unable to collect in the midst of a parched desert, is abundantly supplied by the deep-searching and tough fibres of the camels'-thorn. An abundance of good water-melons are thus grown in a soil, which is incapable of culture. The plant itself produces small oval leaves for a few days only during the spring, which are succeeded by crimson-coloured flowers.

Travellers gaze with astonishment on the pyramids of Egypt, on the fountains and the columns of Rome, on the works of men, who are now forgotten, and whose

structures, though calculated to overwhelm the mind with astonishment and admiration, can lay claim to no real utility; yet they too frequently forget that all around them are traces of the footsteps of that great Being, whose goings forth have been from all eternity: that they are impressed on the summit of the mountains, in the oozy bed of ocean, amid pathless deserts, as well as in scenes of fertility and beauty. He has caused grass to spring forth, and herbs and fruitful trees for the use of man, and has admirably adapted them to every country, and to the necessities of its respective inhabitants. I can even believe, so great is the beneficence of that Almighty Being, by whom the universe is framed, that every country has some plant peculiar to itself, which thrives best, and appears more beautiful than it would do in any other part of the world; some tender and convincing proof, that as a father pitieth his children, so the Most High condescends to sustain and pity those, whom he remembers to be but dust. Let us extend our researches on this subject, as far as the discoveries of various travellers enable us to ascertain the important fact.

Palm-trees shade the sultry regions of the Line, and vast forests of mossy firs extend to the borders of the frozen zone. These two great families vary in accordance with the places in which they grow. Thus in the former, the cocoa and the date, the palm and the latenier have each its assigned locality; one grows best on the sea-shore, another in a rich soil, a third springs from the fissures of the rocks, a fourth prefers high windy places. In like manner the pine, and spruce, the majestic cedar, and the imperishable larch, divide among themselves the empire of the north. This obvious arrangement, by placing the most remarkable forest-trees in their respective places, enables us to trace

the goodness of the Divine Being, in the use to which he has applied them, and furnishes a clue to the varieties that are frequently discoverable.

And how admirably are trees adapted to answer the most important purposes! The pine-forests of which we have just spoken, cover not only Finland, Ingria, and Esthonia, with the whole space between Petersburg and Moscow, but they extend over a great part of Poland, till checked by the appearance of those fine oaks, which announce that a different order of vegetation has commenced. These forests are so extensive, that a squirrel may bound over the greatest part of Russia, without touching the ground, by springing from branch to branch. Yet still they are only a small part of those, which extend towards the frozen north, from Breslaw to its icy shores, from Norway to Kamtschatka, with the exception of some sandy deserts. These forests furnish secure retreats for such animals as frequent them, and form an ample roof above their heads. The gigantic firs, whose lofty and tufted pyramids bear up a load of snow, and prevent it from falling around their roots, and whose branches are mantled with long grey mosses, extend far as the eye can reach, and are peopled with the furred natives of the woods, bears and arctic foxes, squirrels and ermines, hares and sables. The ground, too, is covered with soft moss, which is often at least a foot in thickness, and with dry leaves, that fall precisely at the approach of the inclement season. These ample storehouses are also furnished with an abundance of provisions, the fruits of those noble trees, which thus afford both a canopy and bed. While the same bounteous hand, which has so abundantly provided for the unconscious inhabitants, has dispersed along the borders of

the forests, sparkling clusters of the scarlet-berried Service Tree. These form a striking contrast to the whiteness of the snow, and invite the birds to an asylum; whither also, when the winter is set in, repair the partridge and the moor-cock, the snow-bunting and the ptarmigan, to find beneath the same friendly shelter, both food and lodging.

Our forest-trees generally shed their leaves in winter, and yet, notwithstanding the severity of cold, the firs of the frozen regions continue clothed with verdure. The Most High has mercifully given the birch and the larch, which lift up their graceful heads amid the evergreens of the north, to shed their slight foliage over the cold hard ground on the approach of winter; while he has appointed the pyramidal fir, to retain hers, as a shelter amid the snow. These noble trees, therefore, as I have previously observed, afford both food and shelter; their parental arms arrest the snow, that would otherwise mantle over the earth, to the depth of many feet; and they hold forth to the climbing squirrel, and innumerable small birds, their open cones replenished with ripe berries.

We may also notice, in connexion with this interesting portion of our subject, that firs are mostly resinous, and thus, they not only shelter animals of various kinds, but they furnish the natives with torches and fuel. The charcoal they produce is peculiarly adapted for smelting the minerals, which often abound in their vicinity, while the mosses, that so abundantly clothe the branches, as to hang like a canopy around the trunk, may be ignited from the slightest spark. A Swedish naturalist relates, that being obliged to pass a night in the lofty mountains of the Straits of Tronto, where he was bota-

nizing, he observed numerous larches completely whitened with moss. The shepherds, in order to amuse him, set fire to the mosses on several of the trees, and immediately the whole country appeared in a blaze. The effect was beautiful, the darkness was instantaneously dispelled, and innumerable sparks seemed to ascend to the very heavens, while a most agreeable odour was everywhere diffused. Our naturalist further observed, that a peculiar kind of fungus grew upon the larch, and that the inhabitants of those sterile regions used it, to keep up their fires, and to make matches. The Creator, in crowning the summits of these cold, and ferruginous mountains, with vegetable torches, has placed the match in their branches, as St. Pierre pleasingly observes, the tinder on their trunks, and the steel at their roots.

Swedish botanists uniformly notice, that the most resinous pines are to be found in dry and sandy regions, and high mountainous districts; and we may also remark, in reference to the general characteristics of the fir, that its leaves are admirably adapted, by their configuration, to resist the impetuosity of the winds, which blow with unceasing violence over elevated places.

Thus they stand, bulwarks of Nature's making, to repel the cold; noble pillars to support the rugged branches, that form impenetrable canopies to resist the weight of snow; but when the winter is past, nothing can surpass the beautiful green tints that are every where conspicuous. The solemn firs then burst into festoons of the most vivid emerald colour, and throw out from the extremity of their branches, yellow tufts of stamina, which give them the appearance of vast pyramids, loaded with little lamps.

Vegetation assumes a very different aspect in the torrid

regions of the globe. There palm-trees, tallipots, cocoas, and bananas, adorn the burning tropics. Their inhabitants suffer much from heat, and, therefore, has the Most High clothed the country with trees of amazing height, and ample foliage, the shade of which defends them from the beams of a fervid sun, and affords a cool and refreshing shelter during the most sultry season of the year. The air beneath, and in their vicinity, is thus tempered, and various animals find beneath them a pleasant and safe retreat. Birds are screened among their branches, and gay-coated butterflies, and burnished insects, retire thither, not so much to avoid their enemies, as to find a shelter from the sunbeams. Who does not acknowledge in this beautiful arrangement, the uniform care of Providence in thus assigning to the south, trees, that are always green, and with an ample foliage, in order to screen the animal creation from the heat. The fruit, also, instead of being exposed to the action of the sunbeams, generally ripens under the shelter of broad leaves, and is either attached to the trunk, or to the sprouting of the branches, instead of being elevated, on a cone, like that of the fir; or open to the sun, as those of our temperate regions, in order to imbibe its fullest influence.

The leaves of exotic plants, are in general extremely beautiful; they either answer the purpose of fans, or umbrellas; and while those of the tallipot are plaited like a fan, those of the banana resemble a long broad girdle. In several species, the magnitude of the leaves, increases in proportion as we approach the Line. The leaf of the cocoa-nut tree, especially that with double fruit, is from twelve to fifteen feet long, and from seven to eight broad. A single one is sufficient to cover a whole family, and affords a delightful shelter from the

heat. That of the tallipot, of the island of Ceylon, is even larger.

The unfortunate Robert Knox tells us, that one of the leaves of this superb tree has been known to cover fifteen or twenty persons. When dry, it is so strong and pliant, as to be folded at pleasure, being naturally plaited like a fan. In this state it is not bigger than a man's arm, and is extremely light. The natives cut it into triangles, though naturally round, and each in travelling carries one of these sections over his head, in order to open a passage through the bushes. They also employ the leaf as a covering to their tents, and consider it as a peculiar blessing of Divine Providence to a country which is alternately exposed to the scorching beams of the sun, and heavy rain.

The leaves of this noble tree may be considered as individual blessings. There are also others, which serve as screens to whole villages, such as the fig-tree, or the banian, which often grows on the burning sands of the sea-shore, and throws out from the extremity of its wide branches a multitude of shoots, which descend to the ground, take root, and form around the principal trunk a vast number of covered arcades, which are impervious to the rays of the sun.

The geography of plants is a subject peculiarly interesting, and in tracing them we have occasion to remark that several species never extend beyond their allotted station. The banana advances from the Line to the southern shores of the Mediterranean. The orange, as St. Pierre observes, crosses its classic waves, and embellishes with its golden fruit the southern extremities of Europe. The most valuable plants, such as corn and the graminiferous tribes, penetrate the farthest, and strong

from their weakness, extend in the shelter of the vallies, from the banks of the Ganges to the shores of the Frozen Sea.

Each soil has its Flora and Pomona; but some are so happily constituted, as to be capable of receiving and bringing to perfection the fruits and flowers of distant regions. Such is especially the case in our own favoured country, which recognizes one thousand seven hundred and fourteen different kinds of trees and shrubs, of flowers and vegetables; but as we recur again towards the north, the numbers gradually decrease. Sweden, has only one thousand two hundred and ninety-nine; Lapland, five hundred and thirty-four; Iceland, five hundred and forty-two; and Spitzbergen, thirty-four. Slender, indeed, is the garland which a botanist could weave from the scanty vegetation that adorns this inhospitable spot. Yet amongst them he would discover plants of acknowledged utility; the cochlearea and the sorrel, which uniformly grow together. The leaf of the first is rounded in the shape of a spoon, while that of the second resembles the iron head of an arrow. Equally dissimilar are their virtues; one is an acid, the other an alkali. They are well known for their antiscorbutic virtues, and are consequently invaluable to the seamen that frequent their coasts. The Most High has filled the temperate and torrid regions with innumerable fruit-trees; but to the barren rocks of Spitzbergen he has assigned only two plants, of which the virtues are well known, and a few grasses for the use of such birds as migrate thither. He knew that none of his creatures could ever dwell in those sterile regions, and he therefore provided for the tempest-driven mariner alone.

It is highly interesting to observe the construction of

such plants as minister especially to the wants of man. Corn, which serves for the general subsistence of the human race, is not produced by vegetables of a lofty growth, but by simple grasses. It is not, consequently, liable to be overthrown by tempests, nor is it exposed to the fury of high winds. We may observe in this arrangement a most striking instance of evident design. If corn had been the produce of lofty trees, the most disastrous consequences might have occurred in the event of war or tempest; the forest might have been set on fire, or overthrown by winds, and ages must have passed away before the injury could have been repaired; but instead of this, our waving corn grows low, and is easily gathered in. This valuable plant also carries its flowers in an ear, and they are generally surmounted with long awns. Cicero remarks, that these are apparently designed as shelter from the rain, without, at the same time, excluding the beneficial influence of air and light. The grasses of hot countries generally produce their seed in flowing or drooping plumes; they are consequently sheltered from the heat of the sun; but when collected into ears, as those, which grow in cold and damp situations, they reflect the rays of light, and ripen fast, in even the most unfavourable seasons. The suppleness of their stems is also worthy of remark, as likewise the admirable manner in which they are strengthened with joints at certain intervals. The leaves, too, how curious they are! how long and slender, how well adapted to bend before the wind! Hence their weakness often avails them more than the giant stems, and firmly interlaced roots of the loftiest forest-trees.

One species is adapted to humid places, as rice, which grows abundantly in the muddy swamps on the banks of

the Ganges. Others thrive best in warm and dry lands, as the maize and millet of Brazil and Africa. In this country wheat prefers a strong soil, rye a sandy one, buck-wheat agrees best with rainy declivities, oats with humid plains, barley with stony ground, and dry upland situations. In the latter the leaves are broad and open, for the evident purpose of conveying water to the roots. The long beards, which surround the grain, are most curiously indented, and hence they readily adhere to the hair of animals, by which means they are re-sown in lofty and dry places, on mountain-sides, and wild sheep-walks. Oats, on the contrary, which grow best in damp places, are provided with narrow leaves, that gather close around the stem, in order to keep off the rain.

These valuable plants abound in almost every part of the known world, amid the snows of Siberia, and under the torrid zone. In such as produce wheat, and barley, for the use of man, and in grasses yielding seed for the pasturage of cattle, and the support of small birds, a spirit of life, independent of all soils and climates, preserves and reproduces them. The pyramids of Egypt are fallen into decay, but the grasses which grew around them when Pharaoh filled the throne, continue even to this day. The proud trophies of Greece and Rome, palaces and temples, obelisks and fountains, the marbles of which were rivetted with iron, are known only in their ruins; while long waving grass, and often that wild corn, 'with which the mower filleth not his hand, nor he that bindeth sheaves his bosom,' and yet is so acceptable to the wayfaring bird, continue to wave in green luxuriance, and have done so ever since they sprang around the base, or mounted the broken ramparts of those splendid ruins.

“ When Jehovah was pleased to command Isaiah the prophet,” said the celebrated Hale, in reference to these transient, though continually renewed grasses, “ to make a public proclamation in the ears of the people, what was it, think you, that he was ordered to announce? Was it some profound secret of nature, which had baffled the inquiries of philosophers, or some great political convulsion, which was to change the destiny of empires? No, these were not the sort of communication most suited to the grandeur of his nature, or the exigency of ours. ‘ The voice said, Cry, and he said, What shall I cry? All flesh is grass, and all the goodliness thereof is as the flower of the field. The grass withereth, the flower fadeth, because the Spirit of the Lord bloweth upon it, surely the people is grass. The grass withereth, the flower fadeth, but the word of our God shall stand for ever.’ ”*

Instead of presenting to our eyes the mutability of power, and the revolution of states and empires, he exhibits a more awful and affecting spectacle. He draws a comparison, from the withering grass, and the fading flower, of the destiny of all on earth; and by those natural objects, which continually present themselves to our attention, he recalls the recollection of our evanescent nature, and the perpetuity of those promises, of that eternal word which subsists from generation to generation.

We have spoken of those trees and plants, which minister especially to the wants of man; there are others which seem equally designed for the arts of civilized life. Witness the Dutch Rush, or Thave grass, and the Teazel.

* Isaiah xl. 6, 7, 8.

The first of these affords a striking instance of natural productions being applied to mechanical purposes; its stems have long been imported from Holland, to polish cabinet-work, ivory, plaster-casts, and even brass. Ingenious men have unavailingly endeavoured to supply by art this admirable contrivance of nature, but every invention has been abandoned, as either defective or injurious. The same remark may be made with regard to the Fuller's Teazel (*dipsacus sylvestris*). This plant, which derives its name from a Greek word, signifying to be thirsty, in allusion to the leaves, forming cavities capable of holding water, is common to uncultivated places and moist banks, though never seen to the north of Derbyshire and Nottinghamshire; on this, in a cultivated state, the vast woollen clothing fabric materially depends. The teasel is employed to raise the nap from woollen cloths, and for this purpose the heads are fixed round the circumference of a large broad wheel, which is made to turn in contact with the cloth; if a knot, a roughness, or projection catch the hooks, they break immediately, without resistance; but any mechanical invention, instead of yielding, tears them out, and injures the surface.

Those arts which either adorn or improve life, are undoubtedly the gift of God. We may read in the twenty-eighth of Isaiah, v. 26 and 29, that the High and Lofty One, who inhabiteth eternity, has not disdained to direct the labour of the husbandman. Throughout the twenty-sixth, the twenty-seventh, and twenty-eighth of Exodus, we find that various beautiful and curious arts were first revealed to man, neither sought out by human ingenuity, nor suddenly brought to mind by any quickness of apprehension, but immediately made known to

Moses, and by him communicated to such as were selected for the purpose. It appears, from the thirty-first of Exodus, that many of those arts, which are now essential to the comforts of civilised society, as the carving of timber, and the shaping of stones, the working of gold, of brass, and silver, were bestowed as peculiar gifts on one, whom the Lord "had filled with his own spirit, in wisdom, in understanding, and in knowledge, and in all workmanship." We further learn, that even the twining of fine linen, with blue, and purple, and scarlet, the arts of dyeing, and engraving, were derived from the same pure source. And to His glory, who first gave them, might they ever have been consecrated, had not man, bent upon his own injury, marred every gift which his Creator assigned him.

It seems as if these beautiful and valuable arts were first bestowed for the accomplishment of a peculiar purpose, namely, the erecting, and adorning of, a splendid tabernacle, in which the Divine Presence was to be gloriously manifested ; but when this purpose was accomplished, it is evident that mankind were allowed to apply the knowledge, which they had thus divinely acquired, to their own immediate benefit. How important to a pastoral nation, must have been the arts of squaring stones, and carving timber ! They are the groundworks of our proudest structures in the present day ; and when we see around us materials for various elegant and pleasing arts, surely we cannot doubt that the Almighty has assigned them to his creature man, as recreations from those often laborious and wearisome pursuits, to which he is subjected ; or else, that he might find in them, a preservation from dangerous and frivolous amusements. Such are the arts of painting, of sculpture,

and of music : and why should not these pure and beautiful arts be devoted to the glory of Him who gave them ? We find that various coloured earths are useful in painting ; marble is the quarry of the statuary ; box-wood is preferred in making flutes ; ivory for the keys of the piano-forte : and without the Indian rubber tree, how could an artist frequently proceed in sketching the works of his Creator ?

There is still another class of plants that are wonderfully adapted to purposes of general utility, and among these I shall briefly notice the sea-mat, a species of basil, and the wild fig tree.

Few, perhaps, can stand beside a raging sea, when the waves gently subside, without remembering the words of inspiration : “ Will ye not tremble at my presence, saith the Lord, who has placed the sand for the bounds of the sea, by a perpetual decree, that it cannot pass ; and though the waves thereof toss themselves, yet can they not prevail ; though they roar, yet they cannot pass over it.”

Thus are the waves restrained ; they unconsciously obey the command enjoined on them from the birth of time, but on the shifting sand no similar mandate is imposed ; hence we often find that fields have been laid waste by its having encroached upon them, and even whole villages destroyed. But the *Lolium*, or sea-mat, which grows on the dryest sand, offers an effectual barrier to the advances of the sea, and man has only to apply the means that God has given him. The Dutch have profited by the knowledge of this fact. Queen Elizabeth was so much convinced of its importance, that she prohibited its extirpation ; and a more recent law protects this plant throughout the places of its growth. When the *lolium* takes root, a sand-hill gathers round it, and in

proportion as the sand accumulates, the friendly sea-mat lifts its head above the waste; hence, most probably, the origin of the low round-topped hills, called links, that extend along a considerable portion of our northern coasts. This valuable plant grows profusely on the sands at Liverpool, where it was placed in order to bind them together; it was also introduced into Cornwall by Mr. Praed, of Trevelhoe, and the sand-floods that formerly desolated a wide extent of country, have been thus prevented.

Let us pause to consider the structure of this valuable plant. The stems are from two to three feet high, and extremely rigid. The leaves are pointed, and thorn-like, and the roots penetrating. No other structure would answer the same purpose; the penetrating roots fix the plant firmly; the rigid stems are not likely to be broken by a sudden sand-drift; and the leaves being pointed and thorn-like, allow the sand to fall between them as through a sieve, from which the wind will not again chase it. Now if the leaves were broad, like those of the giant's coltsfoot, or if the stems grew higher, or were light and bending like the rush, the same purpose could not be effected. But here every thing harmonizes, the sand is adapted to the plant, the plant to the sand; the leaves, too, are defended with a firm hard cuticle, that prevents the fine particles of salt, which fly from off the surface of the sea, from penetrating into the pores. Without such a provision the *lolium* would soon perish, as is frequently the case with even hardy forest-trees, when planted by the sea; and could we examine the structure of the leaf, I doubt not but we should find it to be endued with a filtering power for imbibing sufficient moisture from the damp sea-air to refresh the plant.

Salt is essential in hot countries for preserving meat, it is also requisite for many domestic purposes; but there are countries so situated, that this valuable article cannot be readily obtained, and yet, without it, much that is necessary to the purposes of life could not be carried on. Such is the case in many parts of Chili; and there we find, accordingly, a species of wild basil, which is covered every morning with sparkling globules of pure salt. The soil does not seem of a saline quality, and the distance from the sea is considerable; no particulars have reached us respecting the structure of the plant, and we cannot, therefore, conjecture how the secretion is maintained. But this we know, that several plants often grow together in the same soil; that the same sun rises upon them; that they are equally watered by the dews of heaven, and nourished by the rains of the same vernal season; and yet, that the moisture of the earth, received through the roots of each, into little vessels running up the stem into the leaves, becomes totally changed in its nature, and either there, or in the bark and fruit, deposits secretions diametrically opposite in their effects; one, perhaps, exuding a deadly poison, the other an innocent and nutritious juice. Thus, beside this salt-exuding basil, may grow a plant, of which the nectary is filled with sweet juice; a rich nutritious fruit, or some herb useful in medicine. Of this the manchineel, and fig-tree, furnish a ready instance. The first is a deadly poison, and even the moisture which exudes in cutting off a branch is highly deleterious; but it has never been discovered at a distance from the coast, or unaccompanied by a wild fig-tree. The fruit of this valuable tree, as well as salt-water, if taken internally, or rubbed on the skin, not only effects a cure, when the poison has

been accidentally imbibed, but also acts as a preservative from the dangerous effects that might otherwise result from sleeping in its deadly shade.

The plants, of which we have now spoken, answer the purposes of man; there are also others, which seem placed as centinels to give notice of approaching danger, and which only flourish where danger occurs. Such is the *Arundo Pragmites*, or common reed, a never-failing indication of impure air, and hence it may be regarded, in warm countries, as a warning buoy. In like manner the *Poligula Senega*, which grows profusely in many parts of South America, not only denotes the presence of rattle-snakes, but is also a specific for their bite. The traveller will do well to avoid passing where it grows, but this he cannot always do, and, therefore, he uses it as a specific. The Indian, who is unfortunately bitten, hastens to the nearest plant, and chews a leaf, the juice of which he partly swallows, and rubs a portion on the wound.

The Parasitic Guacco is indigenous to the wildest parts of South America, amid scenery such as Europe has not to boast. This plant may be seen twined up the highest trees, and throwing its graceful branches around their giant trunks, it uniformly makes known the vicinity of poisonous serpents, yet such are its specific virtues that the Indian does not fear to fill his hand with its leaves, and then to pick up even the deadly *copra capello*. The reptile has been often seen to change its colour immediately on coming in contact with the leaves, and to remain quiet, as if in a fainting state. Colonel Hamilton relates, that the virtues of this extraordinary plant, were first discovered by an Indian, while working in one of the vast forests of Antioquia, in Columbia. A combat was

going on between a small bird, called a snake-hawk, and a snake, and, while watching them, he observed that whenever the bird was bitten, he immediately flew to the guacco, and eat some of its berries. He then returned to the combat, and again availed himself of the virtues of the friendly plant. But the snake had no such antidote, when wounded by the sharp bill of the enraged hawk; he grew weaker and weaker, and was at length killed by his antagonist, who presently consumed him. It has been said, that the whole creation beautifully sets forth, in visible characters, those things which are invisible. The Christian reader may discover in this incident, a shewing forth of one of the most affecting truths, which revelation has unfolded.

Other plants serve as specifics in the various disorders, that are incident to the countries in which they grow.

The Lycopodium, or club-moss, is found plentifully in that part of Poland, where the terrible *plica polonica* prevails. A decoction of the leaves is a well-known specific. Olive-trees abound in countries which are subject to the plague. Their oil is asserted to be a cure for that tremendous scourge; in proof of which, we are informed by George Baldwin, Esq., Consul-General at Alexandria, to whom the public were first indebted for this valuable discovery, that among upwards of one million of inhabitants, carried off by the plague in Upper and Lower Egypt, during the space of four years, he could not discover a single dealer in oil. These are prominent instances; many more might be adduced. Nor is it, perhaps, too much to assert, that specifics are found in every country for the disorder to which it is most subject. Look, for instance, at the Peruvian bark, which grows most abundantly on the long chain of mountains that

extend to the north and south of Loxa, and which is so valuable in intermittent fevers. The discovery of this remedy was owing to one of those occurrences, which men call accidents, but which ought rather to be attributed to the goodness of that Being, who liberally provides for the necessities of his dependent creatures. A heavy gale of wind having blown some Peruvian bark-trees into a pool of water, it became so bitter that every one refused to drink it, until one of the neighbouring inhabitants being seized with a violent paroxysm of fever, and finding no other way to quench his thirst, was forced to drink of this, and was in consequence completely cured. He immediately related the circumstance to his friends, many of whom were suffering from the same complaint, and to whom it proved equally efficacious. The use of this excellent medicine was not, however, much known till the year 1638, when a signal cure having been performed by it on the Spanish viceroy's lady, the Countess del Cinchon, at Lima, the Peruvian bark came into great request, and was called the countess's powder. This lady, afterwards, distributed a large quantity to the Jesuits, in whose hands it acquired still greater reputation, and by them was first introduced into Europe.

Witness, also, the Palma Christi, so important in the West Indies. The Quassia of South America, a specific in the malignant endemick fever which frequently prevails at Surinam; and the Ginseng, so valuable in Tartary and China for many of the disorders that are incident to that climate.

We could enlarge much on this interesting portion of our subject, and point out the adaptation of many other forest-trees to the sites they occupy, and to the wants of man. But this would lead us too far; we shall, therefore,

briefly notice the admirable construction of the vegetable kingdom, and then pass on.

What a wonderful variety is every where discoverable in this part of the creation. Trees of all shapes, and every variety of use! Some are employed in building, others for household purposes: the timber of one is soft, of another hard; some rise to a commanding height, others creep upon the ground; a considerable number yield valuable fruits; a few, medicine. All have some purpose to fulfil in the great economy of nature.

We may speak also of their structure. The loftiest oak is fixed firmly in the ground by means of roots, which descend far into the earth, and enable it to resist fierce winds, and beating tempests; from out of these ascends the stem, that mighty pillar, which bears up the branches, and presents both leaves and flowers to the sun. Up that stem, and along those branches, and throughout the leaves and flowers, the vessels pass, that convey sap to every part, and nourish the whole tree, by means of their exquisite and varied machinery. What an astonishing combination of cells and vessels! what arrangements! what chemistry, exists in every forest-tree; many of which, during a period of, perhaps, two hundred years, prepare nutritious food, raise the moisture of the earth, to the height of frequently an hundred feet, convey it down again to the root, deposit in the bark, or roots, or leaves, secretions diametrically opposite in their qualities, yet often highly beneficial. They also conceal beneath a rough and hard bark, and inanimate layers of a woody substance, all the movements of organized life. How curious, too, is the mechanism of the leaves and flowers. Every little leaf, which shines and quivers in the sunbeams, is an organ of respiration to the parent

plant, supplying, by means of absorbing vessels, in a great degree, the want of water to the roots ; drawing in the atmospheric air, purifying the most obnoxious, and breathing it out again in a state fit for respiration. They are, moreover, defended by a coating from external injury, and enabled, by a curious mechanism, to turn their upper surfaces to the air and light. And how wonderful is the thought, that every branch, and leaf, and even the juices of the tree, swarm with inhabitants, some of which are obvious to the unassisted eye, whilst others are discoverable only by the highest magnifiers ; yet all are endowed with life, and motion, capable of pleasure, and susceptible of pain. Beautiful too is the formation of every blossom. Take, for instance, those of the chesnut, or the apple, the cherry, or the pear. How elegant they are, how fragrant, how finely tinted, how perfect in every part ; whether we consider the pistil, or the stamens, the anthers, or corolla. All tending to the same ends, that of producing fruit or seeds ; the one good for food, the other to preserve and to increase different species of trees, or vegetables. How wonderful is the construction of seeds, and how admirably are they adapted for the purpose to which they are assigned. Some are fitted for taking long voyages, and these grow on trees by the water-side ; some are furnished with little wings, and are thus scattered by the autumnal breezes ; such as affect a peculiar soil fall directly upon the ground ; but if they are so small and light, as to be wafted by the slightest breeze, they are often furnished with one or more hooks, to prevent them from being carried too far. Thus the seeds of the oat have only one hook ; those of the agrimony and goose-grass are provided with many. The kernel of the pine has small wings, by which it flutters to the ground ; while

others are suddenly thrown out from the capsule, which contains them, by means of a peculiar mechanism. The cocoa-nut, as it falls from the lofty tree, on which it grows, is heard to a considerable distance; such also is the case with the fruit of the Genessa of the Antilles; while the black pods of the Canneficers, when ripe and agitated by the wind, produce, in clashing one against the other, a sound resembling the tic-tac of a mill. Warned by these sounds, many guests resort thither in quest of a repast: the monkey, and the squirrel, the paroquet, and nutcracker, hasten to the feast, and the fragments are as eagerly sought after, by the numerous little insects that frequent the trunks of high forest trees. The fruit of the genessa is peculiarly grateful to land-crabs. This tree rises to a considerable height; its fruit is consequently inaccessible to them, as they cannot climb; but the difficulty is obviated by its falling to the ground, and they are warned, by the rebounding noise, that their favourite repast is spread. How widely different is the construction of the dandelion, with its broad yellow flower! that gay looking plant, which often grows at the root of the towering genessa, and delights especially in dry and elevated places. Its seeds form a beautiful globe of barbed arrows, which fly off, by the help of the wind, towards the summits of the lofty mountains, which it is designed to embellish. The seeds of the dandelion are far more elegantly constructed than those of the majestic cedar. They are light and buoyant, and borne rapidly by the slightest breeze. A tempest is required in order to bear, to any distance, the cones of the cedar, or the heavy fruit of the majestic cocoa; but the breath of the zephyr is sufficient to sow the seed of the dandelion. This unassuming plant is invaluable to several small birds and quadrupeds,

which live principally upon its seeds. It is also salutary to the human species, especially in the spring; and hence our poor neighbours gather its young shoots as a sallad. It universally thrives in dry places; and even in the cracks of pavements; and carpets, says St. Pierre, the court-yards of those deserted mansions, which its golden-coloured blossoms mantle with a luxuriant vegetation. Beautiful they look, and among them occasionally a feathered sphere rises from out a bed of verdure.

We have spoken of green leaves, as organs of respiration to the parent tree; they have also other uses equally important, and illustrative of the manifold purposes which every created thing is designed to answer.

When summer passes by, and the sun declines in the ecliptic; when the night grows cold, and frost begins to whiten the fields, the flowers to close up, and all the summer birds are gone; seeds, scattered by the wind, lie thick upon the ground, into which they are daily drawn by earth-worms, or forced by heavy rains; and innumerable plants require some assistance to defend them from the cold. About this time, leaves, beginning to lose their vital powers, imbibe so much moisture from the atmosphere, that they turn brown, and hence that exquisite variety of intermingling hues, which so vividly diversify an autumnal landscape; but when the nights grow colder these leaves begin to fall.

They lie soft and thick upon the ground, not with a heavy pressure, to crush the feeblest insect, or to bruise the tenderest seed, but light and warm, a sufficient covering for every thing that requires shelter. Leaves, too, are non-conductors of heat, and hence, whatever degree of warmth remains, is rather augmented than diminished;

and warmth there is, for each little plant has a certain portion, else its juices would freeze up ; and every animal and insect has sufficient to preserve within it the vital spark, while that vital spark is allowed to remain. Leaves, therefore, are great preservatives of heat ; and on these leaves, so light, so soft, and warm, the frost lies thick, and the snow often forms a pure white covering. Thus all things remain, the leaves carefully treasuring whatever is assigned to their care ; the frost rendering the soil more loose and friable, and adapting it for tillage, and the spreading of roots ; and the snow guarding the vegetable world from the intense cold, which is often experienced in winter, till that glad season returns, when a general renovation commences throughout nature. High winds begin to dry the earth ; insects, and small animals, are all in motion ; and early flowers, peeping forth from their friendly covering, seem to welcome the return of spring. The high winds also scatter the leaves, which then being no longer useful, are spread abroad upon the earth, and rapidly decay, and thus a fine and rich manure is formed by their decomposition, either to nourish the parent trees, from which they sprang ; or to assist the vegetation of the seeds, and the rapid growth of the young plants, which they have sheltered through the winter.

What a beautiful system of mutual aid and dependence is every where conspicuous. All created things minister to the public good ; all cheerfully repay the debt of gratitude, which they owe to one another ; all show forth the glory of that God, who called them into being ; all, alas ! but man. He, too often ungrateful, and regardless of his true interest, refuses obedience to the

precepts of unerring Wisdom, and cruelly oppresses his fellow man. He knows not the things that belong to his everlasting peace, neither can he understand them, because he neglects to seek that wisdom, which would enable him, as beautifully to manifest the great end of his mysterious being, and as beneficently to assist his fellow mortals, as the creatures do by which he is surrounded.

FOURTH DAY OF CREATION.

And God said, Let there be lights in the firmament of the heaven, to divide the day from the night, and let them be for signs and for seasons, and for days and years.

And let them be for lights in the firmament of the heaven to give light unto the earth, and it was so.

And God made two great lights; the greater light to rule the day, and the lesser light to rule the night: he made the stars also.

And God set them in the firmament of the heaven to give light unto the earth;

And to rule over the day, and over the night, and to divide the light from the darkness; and God saw that it was good.

And the evening and the morning was the fourth day.

GENESIS i. 14—19.

DAY dawned, yet it dawned over an unpeopled world. But now the time was come when this fair globe was designed to experience the immediate and unobstructed influence of light and heat. The obscuring clouds were

now to be dispelled, and the sun and moon were to acquire their first visible existence, with relation to this earth.

A bright light was seen towards the east, and a glow that never before lighted the mountain tops. Then it seemed as if the grey canopy of clouds was gradually drawing off, and a glorious luminary rose above the horizon; by degrees that luminary seemed to journey up the heavens, now lost, perhaps in dense clouds, and now emerging to the view, till at length it most gloriously broke forth, and sudden was the splendour that illumined this fair world. The cloudy covering was thrown aside, and all those fair and floating forms, those rolling masses, and light flying clouds, that beautifully diversify our summer skies, began to vary the clear azure.

But how different was their appearance, from that cloudy medium, through which a pale and ineffectual light had struggled for admittance. The sun shone forth, and lighted up every leaf and flower with unwonted greenness and beauty; the streamlets flashed and sparkled as they passed, and all was splendour and luxuriance.

The world was then beautiful, but all silent. No sound was heard, except the rapid flowing of clear waters, the rustling of the leaves, and the gentle whispers of the wind. There was no singing of birds among the branches, nor humming of bees around the hive, nor the pleasant lowing of cattle on the hills, nor the bleating of sheep in the green valleys. It was a beautiful, but a solitary world. Thus passed the fourth day, and the sun descended towards the west, while around him gathered a gorgeous canopy of clouds.

Gloriously the sun had risen, and as gloriously he

set. Grey twilight succeeded, and then one little star, and then another, lighted up in the immensity of space.

The moon at that memorable period was also made to serve in her season, for a declaration of times, and a sign to the world, shining in the firmament of heaven, the glory of the stars, an ornament giving light in the highest places of the Lord.*

And in this we may observe, as a remarkable coincidence, that the Most High reserved the disclosure of those two great lights, that were to rule the day and the night, till that important day, in the history of this world's creation, when the moon, the faithful witness in heaven, had acquired a visible existence, and became decidedly apparent to the earth. Hence it appears that the period, in which the sun and moon were first exhibited as ruling the day and night, exactly coincides with the day of the lunar revolution, in which, by the laws of creation, the moon was first enabled to acquire its ruling character in the heavens. We may further observe, that when in the beginning, God created the heaven and the earth, when he gave the latter its first impulse of rotation, and first illumined the solar atmosphere, the two presiding luminaries were in that particular relation to the earth which astronomers call inferior conjunction; also, that in the third diurnal revolution of the earth, they first acquired the relative aspect, which enabled them to appear as the two great indexes of years and months. The new moon being thus in the third day of its revolution, that is, in its first quarter, it would necessarily appear at the setting of the sun, and so begin, lead on, and rule the night. And

* Eccles. xliii. 6—9.

hence it seems that the first day of creation was both the first day of the first year, according to solar computation, and the first day of the first month, according to lunar computation.*

It is, therefore, clear that the same sunbeams which shone forth in all their splendour from the source of light, were precisely those that during the three preceding days had been transmitted through an aqueous, or a cloudy medium.

Thus then, were placed on high, two most important indexes for the measurement of time, which the Creator himself ordained to serve for the notation of successive periods. The one to rule the night, to shed its mild and gentle influence over a sleeping world : the other to light up the earth, and make it glorious with all imaginable splendour.

But that bright luminary set on the evening of the first day to a great portion of the earth. And then how gloriously shone the night with her faithful witness high in heaven, and the beautiful stars, and the fair planets that keep on their ceaseless dance.

Mercury, and Venus, fiery Mars, and Jupiter, with his four moons and belt of uncertain use ; Saturn, with his celebrated ring, and seven satellites ; and the Herschel, or Georgium Sidus, which is conjectured to form the present limits of our planetary system.

Worlds those are on high, beautiful worlds, though very different from our own, yet most probably the habitations of innumerable creatures, with souls fitted to admire the stupendous wonders of creation, and with bodies well

* Comparative Estimate of the Mineral and Mosaical Geologies, p. 196.

adapted to the sphere of being which they are designed to fill.

First, then, is Mercury, the nearest planet to the sun, that has been yet discovered. In size it nearly equals the habitable portion of our globe, being calculated to comprise about thirty-two millions of square miles. The unassisted eye can rarely discern this beautiful little planet which revolves so near the sun as to be seldom visible. Few discoveries, therefore, have been made on its surface; even with the assistance of the highest telescopes. All that we know respecting it, is merely, that it performs its annual journey in eighty days, and that the solar fountain must appear to its inhabitants, at least seven times larger than to ourselves; hence, if the degree of heat is in proportion to a planet's nearness to the sun, the heat of mercury must be seven times greater than what is experienced on the surface of this globe: a heat so great that, if we were to be placed in a similar position, our rivers would be dried up, and the great sea converted into vapour. How then, it may be asked, can any organized being exist on such a burning surface? We hear that it is difficult to live in the deserts of Arabia; but their heat is coolness compared with that of burning Mercury. If the Most High has decreed that Mercury should be inhabited, he undoubtedly has adapted the constitution of his creatures to the ardent atmosphere for which they are designed. It is even possible that the beings which inhabit it, may be constituted exactly like ourselves. Modern discoveries lead us to conclude that the degree of sensible heat diffused throughout the planetary system, or in the atmosphere, is in exact proportion to the quality of caloric contained in each, though qualified by the peculiar constitution of the inhabitants, according to the distance

of the planets from the sun; and that these different portions of caloric are put into action by the solar rays, so as to produce exactly the degree of heat that is essential. Mercury, therefore, may not be really hotter than the planet Jupiter, although one revolves at the distance of four hundred and ninety millions of miles from the centre of light and heat; and the other is nearly lost in the effulgence of the solar blaze. A considerable quantity of caloric may be diffused throughout the former, and a small portion over the latter, and so in proportion throughout the planetary orbs, in accordance with their distance from the sun. Facts and experiments lead to the conclusion that such is actually the case, and, therefore, we have every reason to conclude, that the planets which are nearest to our sun, are neither parched with excessive heat; nor yet that the most distant are exposed to all the rigour of insufferable cold.

Venus, the beautiful planet Venus, is nearly the size of our earth; it revolves around the sun in two hundred and twenty-four days, and performs a daily rotation on its axis in twenty-three hours and twenty minutes. This fair planet is, occasionally, so brilliant as to be seen in full daylight with the unassisted eye; but its brilliancy occurs at intervals only, and sometimes it is comparatively dim. When apparent in the heavens, as a morning, or an evening star, it attracts universal notice, and none among the starry host have been so much celebrated. The mighty orbit of this planet, though small when compared with those of Jupiter and Saturn, comprises an extent which seems to overpower the imagination, even sixty-eight millions of miles; and when it approaches nearest to our earth it is twenty-seven millions of miles distant. Were the whole of its enlightened surface visible, it would then appear like a

clear bright moon ; but at that time its dark hemisphere is turned towards us. As it journeys on in the great tract, which it has invariably encircled since the birth of time, it seems to pass successively through all the shapes and appearances of the moon ; at one time, gibbous ; at another, crescent-shaped ; at another, round and clear ; thus proving that its light is derived from the same great fountain as our own. Astronomers relate that its surface is varied with high mountains, one of which rises to an elevation of nearly twenty-two miles, and that it is encompassed with an atmosphere the densest part of which is sixteen hundred feet high. Thus much is all that the telescope reveals to us respecting the beautiful Venus.

Next comes our earth, revolving round the sun in three hundred and sixty-five days, five hours, and forty-nine minutes, at the distance of ninety-five millions of miles ; and upon its axis, in twenty-three hours, sixty-six minutes, and four seconds. The former is its annual, the latter its diurnal motion.

How grateful are the vicissitudes of day and night—how advantageous the succession of heat and cold. With what a steady march all things proceed, and how harmoniously the circling seasons, and the swiftly revolving days accord with the necessities of all created things !

“ Night wanes—the vapours round the mountain curl’d,
Melt into morn, and light awakes the world.
Then mighty nature bounds as from her birth,
The sun is in the heavens, and life on earth ;
Flowers in the valley, splendour in the beam,
Health in the gale, and freshness in the stream.”

Man goes forth to his daily occupation till the evening. Then the flowers shut up, and the birds cease their war-

blings. Twilight succeeds, and night comes on; the labour of the day is over, and the weary are at rest.

Thus beautifully moves the day, and silently proceeds the night: and for nearly six thousand years has morning thus awoke, and day closed in without a single interruption. And as the days harmoniously proceed, so does the year. Spring, the jovial playful infancy of all living creatures, has cheered the world with its glad presence since the earth was formed; summer succeeds, the fruits begin to ripen, and the meadows stand thick with grass; the arable land with corn; then comes autumn, with her grain and fruits, her gladness and her plenty. Quiet winter closes in the year—a time of apparent rest; yet much is going on for the ensuing season, that the gracious promise of spring-time, and of harvest, may continually be accomplished.

All, then, is admirably arranged in this world for the good of man. A beautiful harmony every where prevails. Nothing is wanted to make us happy; and, depraved as too many are, this world might yet become a paradise, if men did but obey the precepts which God has given them, in his most blessed word. Here are wonders to delight the eye of the most inquisitive, and to call forth the admiration of the most contemplative; harmonies and concerts, whether of sounding winds, or falling water, or the melodious songs of birds among the branches, to delight the ear of the most musical; fruits to gratify the most delicate taste, and fragrant odours to please the sense of smelling.

Next comes the moon, our gentle, ever-accompanying satellite. She revolves around us in twenty-seven days and eight hours; but the period from one new, or full moon to another, is about twenty-nine days and twelve hours. This beautiful planet is the nearest to us of all the



LUNAR SCENERY.

heavenly bodies, being only about two hundred and forty thousand miles distant. Her surface, when viewed through a telescope, presents an highly interesting appearance, varied with rocks and valleys, with mountains, plains, and elevated ridges. But the most singular feature in the lunar scenery are those ranges of circular mountains, which appear to rise at least three or four miles above the level of the adjacent districts, and surround, like mighty ramparts, an extensive plain, in the midst of which appears an insulated and conical hill. Imagine one of these level plains, girded round with mountains of considerable elevation, whilst a stupendous mound rises in the centre, a mile and a half in height. From this, how beautiful must be the view! how sublime the effect of the extensive plain below, and the boundary of circling hills, in every diversity of shape! From the plain beneath, how pleasing must be the prospect, if the plain is grassy, the central hill finely wooded, and the amphitheatre of hills diversified with forest trees, with here and there a roughly broken mass peeping through the foliage, and on high the rugged tops of the mighty rampart appearing against a clear blue sky. He, also, who should climb the circular ridge, and seat himself on one of the highest pinnacles, would be amply rewarded by the beautiful appearance of his own conical hill, and its level plain; while other ramparts would be seen in various directions, with their circular ridges and conically shaped hills.

Certain luminous spots have been occasionally discovered on the dark side of the moon. Probably they are occasioned by volcanic fires, or else by some splendid illumination, produced by the lunar inhabitants during their long nights. Our telescopes are not sufficiently

powerful to ascertain whether this fair planet is peopled ; but we cannot help believing that such is actually the case. Else why, we may ask, the mountains and the plains, the hills and their adjacent valleys, why the rotation of the moon upon her axis, and the friendly light that is afforded her in return for what she has bestowed upon us, if she be without inhabitants ? Can we, indeed, imagine, that fifteen millions of square miles, with its beautiful hills and valleys, are solitary and unpeopled ? That the sun shines upon them by day, and the earth by night, for no assignable purpose ? that an atmosphere encircles them in vain ? and that their streamlets flow on, and diffuse fertility as they pass, without an eye to look upon them, or an heart to be lifted up in gratitude ?

We owe much to this friendly planet. She is set, not only as a faithful witness in the heavens, for times and seasons, for days and years, but to occasion that ebbing and flowing of the tide, from which so many, and such important advantages are derived. We may also notice that singular position of the planet, during the time of harvest, which enables the reaper to work for several successive nights to a late hour. I shall never forget the striking effect that was produced by a fine harvest moon, when I was crossing Sedgmoor, that celebrated spot which decided the fortunes of ill-fated Monmouth. It was then, no doubt, little else than a sedgy common, planted with a deep dark wood, and bounded on one side by a considerable hill. But the scene was greatly changed when I saw it ; the dark wood was cut down, and the hill enclosed. The evening was a cloudless one, at the latter end of August, and the sun, in setting, had left his ruddiest glow upon the western horizon. The harvest moon was fully risen, and most beautifully did it shine upon the quiet

landscape. Labourers were busy in cutting down the corn, and heavy laden waggons were seen piled up with produce. Upon these the moon shone bright, and showed also the sturdy reapers, with the women who followed to tie up the corn, and the merry little children, with their blue aprons, and wild poppies. Others, in the distance, were scarcely distinguishable: but the ear readily caught in the profound stillness of that hour, the sweeping sound of the rapid sickle as it cut down the ripened ears.

It was a scene not readily to be forgotten. Very often since has the moon lighted up my own calm valley, and shone bright upon its silvery mists; very often too have I watched its beautiful effects on aged ruins and rich tracery, but never with such associations and feelings of deep interest as on Sedgemoor.

We have now to speak of Mars, that angry-looking planet, which derives a fiery glow, from the dense atmosphere that surrounds him. A luminous zone has been observed around the poles, and this is subject to perpetual changes. Herschel conjectures that these changes are produced by the reflection of the sun's rays on the frozen regions, and that the melting of masses of polar ice occasions those incessant variations in its magnitude and appearance. This planet performs its rotation in one year and ten months; its diurnal one in twenty hours and forty minutes; and, as the inclination of its axis to the plane of its orbit is nearly similar to our own, the length of the day and night, and the vicissitudes of the seasons, are probably the same. Our earth must appear, alternately, as a morning or an evening star to its inhabitants, and exhibit all the phases of the moon.

Four planetary bodies have lately been discovered between the orbits of Mars and Jupiter, though somewhat

varied from those which compose our system. The first of these is Ceres. Its year is equal to four of ours, and seven months; and it appears enveloped in a dense atmosphere. Pallas comes next; the year of which is of the same length as that of Ceres, and its atmosphere equally dense. Juno travels round the sun in four years, and one hundred and thirty days, and is free from the nebulosity that envelopes its sister planets. A peculiar eccentricity of orbit distinguishes this globe, which is at one time a hundred and eighty-nine millions of miles from the Sun; at another three hundred and sixteen millions. Vesta appears like a star of the fifth or sixth magnitude, and is seldom visible to the naked eye. It shines more clearly than the other planets, and no atmosphere has hitherto been discovered. Astronomers are undecided with regard to its diameter, but it sheds a peculiar lustre, which must necessarily be reflected from a considerable surface.

Jupiter next attracts our notice; that magnificent planet which performs its annual revolution in nearly twelve of our years, and moves at the rate of twenty-nine thousand miles an hour. Jupiter is the most splendid of the planets, being fourteen hundred times larger than our earth, and its short nights and days are comprised in nine hours and fifty-six minutes. The portions, therefore, of its surface, about the equator, move at the rate of twenty-eight thousand miles an hour, which is nearly twenty-seven times swifter than the Earth's diurnal motion. This planet is attended by four satellites or moons. The nearest goes round it in forty-two hours and a half, and must appear at least four times larger than our moon; the second being farther distant, more nearly approaches our own in size; the third is somewhat less, and the farthest, is about one-third of our Moon's diameter.

These satellites must be frequently eclipsed in passing through the shadow of Jupiter, and it is by them that the motion of light is principally ascertained; they are also of essential use in determining the longitude of places on our own surface. How beautiful must Jupiter appear when seen from his nearest moon, at least a thousand times as large as our moon looks to us; sometimes shining brightly with a full round face, at another, crescent shaped; again as a half moon, and then with a gibbous phase, in regular succession, every forty-two hours.

The axis of Jupiter is nearly perpendicular to his orbit; he has, in consequence no sensible vicissitude of seasons. But the most striking characteristic of this fair planet, are those dusky appearances, or stripes, which extend across his disk in lines parallel to the equator. These are termed his belts, but what they are, no one can possibly determine. Occasionally they are very numerous, sometimes from five to eight are visible, and yet so mutable, that two of them have been seen to disappear during the time of a casual observation. Their breadth is likewise extremely variable, one will occasionally grow narrow, while another has increased rapidly, as if it had flowed into its neighbour. They often remain unchanged for months, and sometimes new ones have been formed in the course of an hour. Astronomers calculate that some of them are at least five thousand miles in breadth. These sudden changes seem to indicate a powerful agency; but whether that agency is exerted upon strata of floating clouds in the atmosphere of Jupiter, or whether they indicate great changes on its surface, our telescopes are not sufficiently powerful to show.

But where shall we find such an astonishing phenome-

non in the whole range of the planetary system, as that of the double ring which surrounds the body of Saturn, and yet no where touches it. This double ring is supposed to be thirty thousand miles distant from the planet; and is carried along with it, in its rapid circuit round the sun. It consists of two concentric and detached rings, the innermost of which is nearly three times broader than the outward one, and measures in its circumference six hundred and forty thousand miles, or eighty times the diameter of our globe. Its breadth is also seven thousand two hundred miles, or nearly the diameter of the Earth. These stupendous rings cast a deep shadow upon the surface; it is, therefore, evident that they are composed of solid matter, and they also appear to be possessed of a higher reflective power than even that of their own planet, as the light reflected from them is far more brilliant. But what, it may be asked, is their use? Evidently to reflect light upon the planet in the absence of the Sun, and perhaps to answer other purposes with which we are unacquainted. They revolve around an axis, and consequently around the planet in ten hours and a half, at the rate of one thousand miles a minute. During fifteen years, or one half the period of the planet's revolution, these splendid circles are illumined on one side, and during the next fifteen, the other side is also enlightened. We can more readily understand the astonishing effect produced by these stupendous rings, when we consider that their apparent breadth equals one hundred times the diameter of our Moon, and that the effect is still heightened by the darkened shadow that is occasionally thrown by Saturn. These rings must, therefore, appear to a spectator on the middle zone of the planet, as two splendid arches extending across the vault of heaven from the Eastern to the

Western horizon. Very beautiful too, must be the effect of their gradual disappearance when the Sun ceases to shine on one side, and is about to shine on the other; when stars which had before been invisible, suddenly seem to take their places in the vault of night, and one starry glitter is every where conspicuous. Then, as gradually reappear the mighty arches, again the constellations withdraw their light, and again the beholder rejoices in the presence of those magic circles which so splendidly illuminate the darkness.

Our own summer nights are beautiful, when the dew lies heavy on the grass, and a deep sleeping mist is cast like a transparent moon-lit mantle on the valleys.

“ When nought but the torrent is heard on the hill,
And nought but the nightingale's song in the grove.”

But how exquisitely beautiful must the night of Saturn appear with his seven attendant moons, under their varied and interesting aspects. One of these may be seen rising above the horizon, another setting, a third entering into an eclipse, and another emerging from it, a fifth approaching to the meridian; one appearing gibbous, and another as a crescent; occasionally the whole of them shining with full effulgence. To which we may add the majestic and solemn motion of the rings; at one time splendidly illuminating the vault of heaven, and eclipsing the brightest stars; at another, casting a deep shade over certain regions of the planet, revealing the starry wonders of the heavens, perhaps, even revealing many constellations which are invisible to us.

How glorious then must be the objects which thus diversify the heavens above Saturn. They were not surely formed to shed their lustre on a wide unpeopled space, but to call

forth the astonishment and adoration of intelligent and thinking creatures.

Herschel is removed even beyond the precincts of mighty Saturn, being at least eighteen hundred millions of miles from that planet; and so far away from our swiftly revolving Earth, that a cannon-ball flying at the rate of four hundred and eighty miles an hour would not reach us in four hundred years. The diameter of this great planet is at least eighty times larger than the Earth, and its long year consists of eighty-three and a half of ours.

We have already noticed that the degree of sensible heat in any of our planets does not depend upon its nearness to the Sun, consequently the temperature of the Georgium Sidus, or Herschel, may be as mild as that of our own world. True it is, that the light which visits this distant planet, would seem dim to us, but a slight modification in the visual organ would enable its inhabitants to perceive objects even more clearly and distinctly than we can. In the absence of the Sun, six moons reflect their borrowed light. They too, must present an endless variety of deeply interesting objects, and beautifully diversify the aspect of the skies.

We have now to mention the comets, those vast, wandering, mysterious bodies that traverse the heavens in all directions, and are distinguished from every other object by their ruddy appearance and long fiery trains. They, apparently, consist of a dark central nucleus, surrounded by a dense atmosphere or mass of vapours, and are now ascertained to move in long narrow eclipses round the Sun. When near the solar fountain, they speed with incredible velocity, even to that of eight hundred and eighty thousand miles an hour, while their sweeping trains extend over a con-

siderable portion of the heavens; but when more distant, they probably move much slower. Sometimes they appear about the size of a fixed star; at others they equal the diameter of Venus; some have even been seen nearly as large as the Moon. The length of their fiery tails is also differently estimated. Dr. Herschel calculated that the nucleus of the mighty comet, which appeared in 1811, was only four hundred and twenty-eight miles in diameter, while its nebulous portion extended to about one hundred and twenty-seven thousand miles. The length of its train he computed to be above one hundred million of miles, and its breadth nearly fifteen millions. We know not whether comets are inhabited, assuredly not by creatures like ourselves, for strange indeed must be the vicissitudes, and extreme the changes, connected with them. At one period of their erratic course, the Sun must appear like a mighty globe, filling the heavens with its brightness, and shedding forth intolerable heat, but gradually its brightness fades, its heat becomes less fervent, and when nearly two centuries elapse, it dwindles to a mere point. The inhabitants, if any there are, would pass in the course of time from the full effulgence of the Sun into comparative cold and darkness. They would ascend with incredible velocity above the orbits of Mercury, and the rapidly revolving planets; leave even Uranus at an immense distance behind them, and glide far away till the brightness of all these were lost to them, and till the Sun itself was seen to twinkle faintly in the distance.

Beautiful, too, are the Constellations. Orion looks down from his high station in the heavens, as erst he looked when this fair world and all its planetary systems were first created. The cross too, which Humboldt saw on the plains of South America more than five thousand

years after it became visible; that beautiful southern cross which announces to the weary traveller that midnight is past, because it begins to bend. Andromeda also, and Perseus, the Pole Star, and the Pleiades, Aries, Taurus, Gemini, the Virgin, and Aquarius, with all those brilliant or dimly twinkling distant constellations, however named, that light up so gloriously the dark concavity of heaven. All these may well awake within us high thoughts of that Almighty Being who has created and sustains them; beautiful do they appear, as we behold the starry glitter which extends from Pole to Pole. But the telescope discovers greater things than these, and clearly makes known to us that some of the most brilliant stars are double, others triple, as in Leo, Bootes, Scorpio, and the Northern Crown; in Cancer too; and that all the triple stars are ascertained to be relatively in motion, and to describe orbits about each other. To this we may add, that Herschel remarked very many other double stars whose movements indicated revolutions round a common centre. M. Struve, of the Dorpat University, first observed this important phenomenon. He examined above one hundred and twenty thousand stars with the aid of a large refracting telescope, and among these he ascertained that three thousand and sixty belonged to the first four classes of double stars. It has been further discovered, respecting the triple star Lynx, that two of them evidently changed their distance in the year 1824, though the farthest of the three remained stationary. Their movements were at the rate of twenty-two degrees in nearly half a century, which announced a complete revolution in six hundred and fifty-six years. In fifty-seven years the three stars came into a straight line.

We have also reason to believe that momentous changes

take place in some of the heavenly bodies. Galileo remarked that a new and brilliant star was twice extinguished during his time. Gemmi also observed that a temporary star appeared in Cassiopeia during the year 1572, which surpassed the most beautiful stars, even Jupiter himself, in brilliancy, and was so bright as to be seen at noon-day. Its light, in time, grew feeble, and in sixteen months, after having become perceptible, it gradually disappeared to the eye of a common observer, and was alone discoverable through a telescope. During the whole time its colour experienced considerable variations; it was first of a dazzling white, afterwards of a reddish yellow, and then of a colour resembling lead. La Place, who steadily observed these variations, conjectured that the sudden shining forth of its vivid light was occasioned by some great conflagration which had taken place upon its surface. This conjecture is farther confirmed by the change of colour, which is analagous to that presented to us on the earth by those bodies which are set on fire, and then gradually extinguished. Observe, for instance, the burning of heaps of withered leaves and dead vegetables which our gardeners and farming-servants gather into a heap, and set on fire. I have often seen them burning fiercely along the sides of our beautiful hills. They reminded me of those unquiet days, when on Border land

“ From height to height the beacons bright
Of the English foeman told.”

But happily our lot has not been cast in such troublesome times, and these fires merely indicate the peaceful occupations of gardening or of husbandry. At first they appear bright, then gradually a reddish glow succeeds, and he

who passes in the morning by the spot where the evening before they gleamed so fiercely, discovers only a heap of whitish or red ashes. How striking then must be the effect of a conflagration on the surface of one of those bright stars, the diameter of which is, perhaps, as large, or larger than our Earth.

Several stars have likewise appeared, shining brightly like the Cassiopeian star for a while in the heavens, and then have suddenly been lost. Others that were known to the ancients cannot be discovered, and stars are now distinctly visible that were unknown to them. Some are noticed by astronomers to be gradually diminishing in lustre, and others are as gradually increasing in brightness. At least fifteen of these luminaries are well known to experience perpetual changes in this respect; at one period they shine forth like stars of the first or second magnitude; at another they are easily mistaken for those of the fourth or fifth, and sometimes they disappear to the naked eye. Then again, light seems gradually to kindle on their surface, and those which could scarcely be discerned now take their places in the heavens, and seem to emerge with redoubled splendour from their gradual obscuration. It also appears that changes are taking place among the *nebulæ*, or those starry systems, groups, or clusters, into which the universe has been divided. The nearest of these is that white space—

“The milky way
Which nightly as a circling zone thou seest
Powdered with stars.”

Among the stars which compose these splendid *nebulæ*, new ones are continually appearing. It even seems as if some of the clusters had been broken in pieces, and that

smaller ones were forming from their fragments. These changes indicate that mighty movements are taking place on high, that worlds are being called into existence, and older ones extinguished.

Very curious too, are the different colours of the Stars. Near the foot of Aries is seen a double star, of which the largest is ruby-coloured, the smallest green. Uranus sheds forth a bluish white light; Pallas a faint rosy one; Perseus exhibits a double star, the one being yellow, the other blue. Andromeda and the Swan exhibit similar phenomena. One star is beautifully white, another red, a third sky-blue. The Lyre has a variable star, which is sometimes white and again red. In like manner the double stars of Hercules show a variety of tints, either bluish white, or ash-coloured, green, or red.

This curious and singular effect is sometimes obvious to the eye. D'Israeli tells us, that when he traversed the plains of Syria, the stars appeared to him of different tints and forms. Some were green, others white, others again red, and instead of seeming to stud a vast and magnificent dome, he could distinguish them to be of different elevations above each other.

Let us now retrace for a few moments, the steps which we have taken.

“And God made two great lights; the greater light to rule the day, and the lesser light to rule the night; he made the stars also.”

This fair earth was then created, a glorious sun was given to enlighten it, and an attendant moon to cheer the hours of temporary darkness. Sister worlds, also, had their being, and revolved round the same common centre. We know that our own world is beautifully and commodiously adapted for its inhabitants; that all needful things

are added to promote their comfort, and that innumerable sources of innocent gratification are shed around us in ample measure. We know all this, and we have every reason to conclude that the same advantages are equally diffused throughout the other planets.

Wonderful it is to read of them, and to consider the amazing velocity, with which they are impelled. To learn that the planet Venus, one of the nearest and most brilliant of the celestial bodies, moves at the rate of seventy-six thousand miles an hour; that the planet Mercury travels with a velocity two thousand times swifter than a cannon-ball; that the planet Jupiter is more than nine hundred times the size of our earth, and that he is attended by seven moons as bright and beautiful as the one fair witness that revolves round us.

We admire a fine rain-bow when it encircles the heavens with a glorious show, and recalls to mind the gracious promise of seed-time and harvest. But how stupendous must be the effect of those magnificent arches, which surround the planet Jupiter,—arches at least two hundred thousand miles in diameter, between which appear the dark heavens studded with constellations. Saturn, another of these planetary bodies, which is nearly lost in the starry effulgence, is on such a stupendous scale as to exceed in size, fourteen hundred globes of the same dimensions as our own; and though the most slowly moving of the planets, it is impelled through the regions of space at the rate of twenty-two thousand miles an hour. And what is the boundary of our solar system in which revolve those mighty worlds, and their attendant satellites? The utmost boundary of the stupendous range in which Herschel moves, is eighteen hundred millions of miles distant from the solar fountain; that great fountain

which is said to be five hundred and twenty times the size of all the planetary globes, and one million three hundred thousand times larger than the earth. Yet this great fountain diffuses light, and heat, and gladness, and fertility, even to far distant Herschel; and how overwhelming is the thought, that each revolving planet carries on its surface myriads of inhabitants!

The thought is indeed overpowering; but the light of science reveals even greater things than these. The stars that sparkle so gloriously at night are luminous bodies of a prodigious size, which shine not with borrowed lustre, but with their own native light. Astronomy makes known to us the distance at which some of them are stationed in the heavens from our solar system; a distance so great, as to render it impossible for them to derive any portion of their lustre from our sun. They are, therefore, suns of other systems; and we may readily conclude that each of these imparts its cheering influence to surrounding worlds.

He who looks up to the clear heavens in a winter night, may reckon, at least, one thousand of those sparkling luminaries. Yet they form but a small portion of the innumerable host. The telescope discovers thousands of bright stars, where the unassisted eye can only trace a very few. Herschel speaks of regions in the most crowded part of the milky way, which contain no less than five hundred and eighty stars; and that, in one quarter of an hour, no less than one hundred and sixteen thousand stars pass across the field of vision. Even beyond these, there are doubtless fields of space, where other suns, and other systems revolve: suns, the light of which has never journeyed to our globe, and peopled worlds which the most powerful of our telescopes would be unable to discover.

Astronomy is a noble science; but let him who imparts the knowledge of it to his children, ever associate with it the handmaid science, botany. They will not then fear to be over-looked amid the innumerable suns and systems that revolve in the immensity of space. For truly there is in astronomy, an overwhelming grandeur, which brings into subjection every feeling of our own importance, and awakens the most exalted sentiments of reverence and devotion. The contemplation of the starry heavens, and those flaming suns the centre of other worlds, swarming with inhabitants, seems to annihilate every thought and every pretension of human greatness, while we are ready to exclaim in the language of David, "Lord! what is man, that thou takest account of him, or the son of man that thou regardest him?" Addison, in one of his masterly essays, has finely dilated on this humbling sentiment, and pressed a farther acquaintance with the minute works of nature as an admirable counterpoise to one of the most mournful reflections that can occupy the human mind. This counterpoise is peculiarly afforded by botany. Its recent discoveries yield a beautiful and affecting illustration of the care which our Heavenly Father extends to the meanest of his works. In astronomy the feelings are overpowered: devotion of the highest description arises in the mind, but it is a devotion mingled with the most awful sentiments; while, on the contrary, the investigation of the natural objects near us, brings the Deity, if we may be allowed the expression, in a more tangible form before our eyes: we see his goodness, we adore his providence; his tender care to the meanest of his works; we observe around us evidences of his presence, and we are conscious that he will not forget us.

FIFTH DAY OF CREATION.

And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowls that may fly above the earth in the open firmament of heaven.

And God created great whales, and every living creature that moveth, which the water brought forth abundantly, after their kind, and every winged fowl after his kind : and God saw that it was good.

And God blessed them, saying, Be fruitful and multiply, and fill the waters in the seas, and let fowl multiply in the earth.

And the evening and the morning were the fifth day.

GENESIS i. 20—23.

THE same Almighty fiat, that rendered the round earth visible, gave existence on the fifth day of creation, to every kind of marine and winged creature. All these were formed in full maturity of structure, in all their component parts.

Then broke forth the song of gladness, and of warbling voices, that were never heard before ; every bush and every tree resounded with joyful harmony, and on high, sweet minstrels bore their cheerful notes, resounding through heaven's concave. The sea too, was filled with innumerable living creatures, all sportive and rejoicing in their new existence. Throughout the vast extent of creation, not a groan was heard, not a pang was felt ; none

were helpless, as in infancy, none were bowed down as in old age. There was freshness on every leaf, and beauty in every flower ; and strength and vigour, high health, and bounding spirits in every animated thing.

Our heavens are now often clouded, and our seas rough with storms, but it was not so then ; and marine creatures of every kind needed not to speed from one another ; for there were no evil passions among them. Sin had not then deformed the fair creation, and the general mass of waters that had been drawn from off the surface of the earth, heaved and sparkled beneath the bright warm sun, who looked down from his high station, and shed abroad, life and heat, and gladness, over the fair and beautiful creation.

Beautiful too was the bed of ocean, for no vegetable decay, nor mouldering remains of mortality disfigured its tranquil surface : that bed had apparently been ruined and disordered, I say, apparently, because the circumstances of its alteration were as much directed by Divine Wisdom, as its first formation. The strata which retained their primitive position throughout a considerable portion of the globe, were here both fractured and disturbed and such innumerable fragments of broken rock, were precipitated into the abyss as formed in many places a stony bed to the new sea. On that bed, and in all the varieties of its parts, whether in its lowest depths, or on the submerged masses, marine productions of every kind were abundantly produced. Beautiful sea-weeds sprang instantaneously from the soil ; coral insects began to work, and their elegant ramifications were seen in all directions ; madrepores too and sea-stars, with innumerable other marine productions ; while the star-fish* shone

* The star-fish is circular, and so beautifully luminous at night, as to resemble the full moon, surrounded by rays.

forth in the cavernous recesses, and lighted up its sparkling lamp, unquenched amid the water. Sea-shells also of all tints, and shapes, were suddenly called forth at the fiat of omnipotence; the elegant nautilus, put up his little sail, and guided his tiny bark on the calm surface of the deep; butterflies of the ocean skimmed rapidly along the waves, and trumpet-shells, and limpets, muscles, and anomiaë, with innumerable others walked forth in all their beauty, themselves as gaily tinted as the corallines or seaweeds, their future habitations.

Time would fail me were I to speak of all the glorious creatures, which the waves suddenly revealed, shells and fishes, and creeping things, great whales and dolphins, sharks and tunny fish, and all those various forms, that are made to pass along the paths of the mighty waters, all of them wonderfully adapted to their respective spheres of being, with their faculties complete.

Thus all were created perfect. And the evening and the morning were the fifth day.

Let us now consider the admirable construction of the feathered tribes, and how wonderfully they are adapted to the sphere of being which they are designed to fill.

There is not, perhaps, throughout the whole extent of creation, a more beautiful or curious object than a little bird. See how elegantly it is formed, how delicately wrapped in feathers, how admirably provided with instruments of hearing, and of seeing, of running, and of flying; how quick its little glancing eye, how elegant the cradle which it constructs for its tender young!

Two qualities are required in the frame-work of a bird, strength and lightness. We find, accordingly, that the cylindrical bones differ essentially in three remarkable properties from those of quadrupeds. Their cavities are

larger in proportion to their weight; they are also empty, and the shell is of a firmer texture than the substance of other bones.

We observe further, that air is generally admitted into almost every part of the interior, and here it will be necessary to inquire by what means such an effect is produced. Air cells are situated in different parts, and these vary in number, and in magnitude, according to the structure and habits of different individuals. In the soaring eagle, and the lark, and generally in high-flying birds, such cells as are placed among the muscles are remarkably large; they even extend a considerable way up the neck, and become enlarged in their progress. It is also worthy of remark that the bones of winged creatures are supplied with a greater or less degree of air, according as they are employed in the office of loco-motion. In birds of rapid flight, they are hollow, for the evident purpose of receiving air, and even in those of moderate powers, the same peculiarity is discoverable. The proof of this may be readily obtained, by comparing the structure of one species with another. It is unnecessary to point out the advantages that accrue from this admirable method of construction, in promoting the flight of birds, through so light a medium as their native element, or even in loco-motion upon a solid surface. They are too obvious to be insisted on. I shall merely observe that the air, while it remains in the bones, and air-bladders, necessarily acquires the temperature of the living bird. It is, consequently, lighter than the atmospheric, and, therefore, acts in a manner analogous to that contained in the swimming bladder of fishes.

Throughout the universe there is a wonderful proportioning of one thing to another, and this is particularly obvious in the eyes of birds. In these the visual organs are calculated

to facilitate the perception of objects through a rare medium, and are admirably suited to their mode of life, and means of procuring food.

As birds depend entirely upon the beak in selecting either grain, or insects, and as the distance between the eye, and its extremity, is in general very small, it is consequently necessary, that they should possess the faculty of distinctly seeing the nearest objects. But on the other hand, as they are frequently elevated to a considerable height, living in the air, and moving through it with great velocity; it is also necessary, in order to ensure their safety, as well as to assist them in discerning distant objects, that the faculty of seeing at a distance, should be also given them; a faculty which birds of rapine possess in a remarkable degree. But how are these dissimilar objects to be ensured? Two peculiarities subsist in the eye of birds, both tending to facilitate the changes upon which the adjustment of the organ of sight to different distances, entirely depends.

The one, is a bony, yet, in most species, a flexible rim, or hoop, surrounding the broadest part of the organ, which by confining the action of the muscles to that part, increases the effect of their pressure upon the orb, by which pressure the axis is lengthened for the purpose of looking at very near objects. The other, is an additional muscle; of which the office is to draw back the crystalline lens, on any especial occasion, and thus to adjust the organ to very distant objects. We find, accordingly, that the eyes of birds are enabled to pass from one extreme to another, in their scale of adjustment, far more readily than those of other animals.

But as nothing is wanting to the exquisite fitness of the organ, so nothing superfluous is admitted. Eye-brows

are unnecessary, because the surrounding parts are covered with feathers, which answer the purpose equally as well, yet in the grouse kind, where an obvious difference subsists in this respect, a naked skin of a scarlet colour projects over the eye in such a manner as effectually to defend it. This is very important to the grouse which seeks its food on heathy commons, and among underwood.

There is still another peculiarity which demands a brief description, and this is the admirable contrivance of the nictitating membrane. The use is to brush the eye, to spread over it the lachrymal humour, to defend it from any sudden injury, and when closed, to shut out to a certain extent, though not entirely to exclude, the light. The commodiousness with which this membrane lies folded in the upper corner of the eye ready for use, and action, and the quickness of its application are properties known to every observer; but what is equally admirable, though not quite so obvious, is the combination of two kinds of substances, muscular, and elastic, by which the motion of this membrane is performed. It is not, as in common cases, by the action of two opposing muscles, one pulling forwards and the other backwards, that a change is effected. No, the membrane itself is an elastic substance, capable of being drawn out like a piece of Indian rubber, and of returning to its former position by the strength of its own elasticity: such being its nature, it is connected by a tendon, or thread, with a muscle in the back part of the eye, in order to render its application easy. This tendon, though remarkably strong, is yet so fine as not to obstruct the sight even when passing across it; and the muscle itself being placed in the back part of the organ, does not interfere with its exquisite machinery. When this muscle contracts, the membrane is instantly drawn over the eye,

by means of the communicating thread : when, on the contrary, the muscular contraction, which is most probably a voluntary effect, ceases to be exerted, the elasticity of the membrane suffices to bring it back again to its position.

In the configuration of the muscle, which although placed behind the eye, draws the nictitating membrane over it, a most curious mechanism is discovered. The muscle is passed through a hoop formed by another, muscle and is here inflected, as if round a pulley. This is a striking peculiarity, and observe the advantage of it. A single muscle with a strait tendon would have been sufficient, if it had power to draw far enough. But the contraction necessary to bring this membrane over the organ of sight, required a muscle longer than the space assigned at the bottom of the eye would admit. Therefore, in order to afford a greater length in a less compass, an angle is made by the cord of the chief muscle. This so far answers the purpose for which it is designed ; but still further, it makes an angle, not round a fixed pivot, but round a hoop formed by another muscle, and this whenever it contracts, of course, twitches the first muscle at the point where they meet, and thus assists the action of both.

There is, as I have frequently had occasion to observe, a wonderful apportioning of one thing to another, throughout the visible creation. The ear is formed to receive the pulses of the air, the eye the rays of light, which like inimitable pencils delineate the glories of the earth and heaven on the optic nerve. And yet in these so much variety is perceptible as clearly to evince their adaptation to an especial purpose. The eye of the eagle receives uninjured a flood of light ; that of the owl is adapted to the gloom of evening. A sparrow-hawk, while he hovers in the air, espies the smallest bird sitting on a clod,

though at twenty times the distance at which a man, or dog could perceive it. The kite, which vanishes in his upward flight, embraces the same ample field of vision. But this prodigious extent, is accompanied, likewise, with an equal accuracy and clearness, for the eye can dilate or contract, can be shaded or uncovered, depressed or made protuberant, and thus it will readily assume the precise form suited to the quantity of light, and the distance of the object.

Light has also a reference to space and motion, and if such creatures as fly much, move with astonishing velocity, we may naturally expect them to possess in a superior degree, that sense which is proper to guide and to direct their flight. If the Deity, while he endowed them with great agility and vast muscular strength, had formed them short sighted, their latent powers would have availed them nothing, and the danger of dashing against every intervening obstacle, might have repressed, or extinguished their ardour. In short, we may consider the celerity with which an animal moves as indicative of the perfection of its vision. A bird for instance, that shoots swiftly through the air, must undoubtedly see better than one that slowly describes a waving tract. Among quadrupeds, the moles have their eyes so enveloped as to render their sight limited.

The instruments of flying are also constructed with admirable skill, and commodiously placed in such a manner as not only to afford an exact counterpart to the subtile medium through which they move, but also to produce as swift a progress as the little frame they are appended to, could bear. The act itself of flying consists in the successive elevation and depression of the wings; the latter motion being performed with so much force and velocity as to compress a volume of air of which the reaction is

sufficient to elevate the body. The use to which a bird applies her wings is also far more complicated, and more curious than is generally known. For if the flapping of the wings in flight were no more than their reciprocal motion in opposite directions, either upwards or downwards, the bird would lose as much by one motion, as she gained by another. The sky-lark, for example, could never ascend by such a movement to her favourite haunt in the blue heavens; for though the stroke upon the air by the under-side of her wing would enable her to rise, the stroke from the upper, when she raised her wing again, would immediately bring her down. But the difficulty is admirably provided for; the form and structure of the wing, its internal concavity, the disposition, and particularly the over-flapping of the larger feathers, the action of the muscles, and joints of the pinions are all adapted to answer the same purpose.

Let us next consider the complete and admirable manner in which the act of flying is performed, What rower on the water, what charioteer on land, what acute mathematician can so readily direct their progress as these untutored artists? How soft, how pliant, and how graceful, are their movements. Poets and philosophers have gazed after them, and wished that they could as readily explore the trackless ether. Successive generations have attempted vainly to produce by chemistry or mechanism what these happy little choristers readily effect by the movements of their wings. And yet how various are the purposes for which they are designed. They serve to bear them up without an effort, to waft them swiftly with a steady progressive motion, to steer and turn them in all directions; now enabling them to soar into the clouds, and now to rest upon the earth, both with inconceivable rapidity,

and gradual descent, as their necessities require, or inclinations lead them.

Next to the wings, the tail is of considerable importance in directing the steerage of a bird through the air; and here it is not a little remarkable that such as are furnished with long legs have uniformly short tails; but in order to remedy the inconvenience that must result from such a privation, nature instructs them to place their legs close to their bodies, and to stretch them, at the same time, as far back as possible. In this position they extend considerably beyond the tail, and answer the purpose of a rudder by assisting the bird in ascending, and descending, by steadying its flight, and keeping the body poised; for when the head points in one direction, the tail or feet inclines immediately to the other.

Pliny conjectures that the invention of the rudder arose from observations made by early navigators on the various motions of the kite, while steering through the air. Certain it is, that many useful arts bear evident indications of being suggested by the instincts of the animal creation.

Thus admirably is a bird constructed; and equally deserving of attention is the light and elegant vestment in which it is wrapped.

This vestment is composed of feathers, which are neatly and artificially arranged, neither ruffled nor discomposed, nor placed in various directions as if by accident, but in such a manner as materially to assist in wafting the body through the air. The elasticity, and warmth, the placing of the feathers, the down around the stems, the overlapping of their tips; their elegant configurations, as well as the variety of their colours, constitute a vestment equally beautiful, and appropriate to the lives they have to lead.

Now in this kind of covering two qualities apparently

incongruous are united; warmth and lightness. Every feather is a piece of mechanism, both thin and hollow, yet compact and firm: the component parts are tough and smooth, pliant and elastic; a peculiarity discoverable in no other class of animals. The pith too, which nourishes the whole is very singular; it is neither bone nor membrane, flesh, nor tendon.

Three different kinds of feathers are obvious in the coverings of birds. The largest are used for flying; they form, when spread, a kind of fan, and are most ingeniously constructed, with an obvious reference to the purpose for which they are designed. Those which cover the body, and are properly plumage, are very differently formed. In these the shaft is short, the vane considerable. They are never raised, except under the influence of anger, fear, or illness, and are placed in such a manner as to fall one over the other, in order to shoot off the rain, and to exclude the cold. In the thick-skinned water-fowl, and in such as have frequently to traverse the wet and stormy regions, they are generally arranged in a quincuncial form.

To these succeed a fine soft down, covering the whole body. It is unconnected with the other feathers, and is evidently designed to exclude that portion of air or rain, which is received through the plumage. This singular provision is very apparent in such as inhabit a humid atmosphere. The down upon the breast, and under surface of water fowls, is, perhaps the slowest conductor of heat with which we are acquainted.

And here, another singular circumstance occurs. In the class of birds which continue with us during the winter, whatever may be the external tinting of the feathers, the down beneath is, uniformly, black. The design of this under-garment is, undoubtedly, to keep in the heat, which arises from the heart, and the circulation of the blood. It

is also remarkable that this peculiarity is unknown in large birds; and for this there is also a sufficient reason. Small birds are more exposed to the cold than larger ones. It is therefore necessary that they should be warmly clad.

We could further speak of the mechanism of the legs and feet,—how admirably the toes are adapted for holding tight the branches of trees when shaken by the wind,—of the bill, and of the organs of hearing; but this would lead too far. We shall, therefore, briefly notice the different modes of flight.

Curiosity having led me some time since to the summit of the magnificent Dinas-braw, which overlooks the lovely valley of Llangollen, I surveyed, in the ascent, with equal surprise and pleasure, the scene below. As far as the eye could reach, appeared a vast sea of vapour, which seemed to cover the plain, and to terminate the wide horizon, excepting when the summits of lofty hills, gilded by the first rays of the sun, occasionally lifted up their heads, and appeared to rise and fall in shapes the most pleasingly striking and romantic. By degrees the mist began to roll away, and the magic of the ærial hues imparted a new character to every object. Mountains and deep declivities, which a few moments before had been scarcely perceptible, now appeared as if mantled with a light transparent vapour, which rendered the tints of nature more harmonious, and softened the flood of light, that was poured from the east, and diffused over the whole scene an indescribable serenity.

Immediately below, appeared the inn and town of Llangollen, and the rapid Dee, now disturbed by troublous eddies, now murmuring on its rocky bed, as if impatient of its narrow confines, and giving that animation

to the landscape, which a mountain river can alone confer on the untamed solitudes of nature. Around it, was all the loveliness of highland scenery; above it, the azure of the heavens unbroken by a cloud; the sun shed unwonted brightness on its waves, and beside it the drooping branches of the oak, the birch, and alder, bent over the stream. Hills, brown with heath, or green with pastures, or cheerfully dotted with the bright yellow blossoms of the gorse, rose in rapid succession from its banks; while, on the western edge, an ancient wood clothed one of the most precipitous descents, and cast a deep shade upon the waters which hurried along with redoubled impetuosity. Further still, appeared a range of lofty mountains; and beyond them an undistinguished mass of eminences, of various sizes, seemed, from their distance, as if blended with transparent clouds.

A few sheep were tranquilly grazing on the summit of the Braw, or resting beneath the shelter of the dilapidated ruin that crowned its highest elevation—once the rampart of iron war in days of feudal barbarism.

This spot will often recur to my remembrance; for here I first observed the flights and motions of innumerable birds, and was hence induced to consider this portion of my subject, with a reference to their general utility.

The goodness of the Creator is not only clearly manifested in providing for the wants, but also in ministering to the gratification of every living creature. Nor is this goodness less seen in their variety than in their multitude. Every organized being has some characteristic peculiarity; but the feathery nations are not more dissimilar in their general localities and modes of structure, than in their different ways of flying, which accord exactly with their

respective capacities and wants. Some launch away with repeated springs, and advance by successive boundings; others seem to glide through the air, and cleave it with an equal and uniform progress. The former skim over the earth, the latter soar into the clouds, and yet, in these, how many evolutions are there! What changing of place, and form, in search of prey! or, to elude the vigilance of their foes. They ascend in right, oblique, or circular lines, appear as if suspended, and continue motionless, then start away in a moment, and glide without opposition, sometimes without effort, wherever their inclinations lead them. Throughout the whole creation nothing is more common than a bird; yet, to the eye of reason, nothing is more astonishing.

Kites and bustards sail round and round, in circles, with wings expanded and nearly motionless, maintaining their equilibrium by a slight exertion of their pinions at distant intervals; or else, floating through the sky with scarcely any apparent motion; and hence the former are still called in the north of England, *Glead*ers, from the Saxon word *glidan*, to glide. The owl moves in a buoyant manner, as if lighter than the air, and requiring ballast. The shrike, the crow, and roller, the oriole, the cuckoo, and wryneck, the king-fisher, the nut-hatch, and the woodpecker, with the hoopoe, and the creeper, generally fly quick, and with a frequent flapping of the wing.

The aerial movements of the gallinaceous tribes, are, on the contrary, very strong and rapid, with an impetuous whirling, and in a strait line. This species, includes the poultry of our yards, with all their numerous varieties; the wandering quail, the gaudy peacock, and the turkey, the pheasant, and the grouse, that loves the mountain coverts, and heathy plains.



SWIFTS ON THE BANKS OF THE RIVER.

The innocent family of Columbine depend for safety upon the rapidity of their flight. Witness that of the messenger pigeon, calculated to fly a mile a minute. Such is also the case with the numerous brotherhood of little warblers that enliven the labours of the husbandman. Among these the swallow tribe is remarkably active; their evolutions are very sudden; and their continuance on the wing almost incessant. They passed in airy wheels around the summit of the Braw; and were sometimes lost in the circumambient clouds, while pursuing with short shrill scream the insects that sported in the sunbeams, making aërial courses at a great height, and encircling a considerable space, with an easy and steady motion.

Nearer to the river, a party of swifts were wheeling in nimble evolutions, now glancing with jetty wing, and now disappearing in the bright sunshine. A variety of little birds were also seen repairing to their sheltered haunts, or open pastures for the day. The yellow wagtail hurried from the mossy banks which confined the rapid waters of the Dee. The thrush, perched on the summit of a birch, that drooped its branches above the river, filled the air with her sweet melody, till being disturbed by the creaking of a waggon, and the hoarse voice of the carter, she darted from her leafy covert, and flew, with a quick motion, to the opposite side of the river, where her soft warbling was lost in the murmur of the stream. The heath-throistle raised her shrill piping note from the rugged side of one of those lofty undulations, which scarcely deserve the name of a mountain, though rising above the dignity of a hill. Titmice, of slender shape, appeared like darts flying through the air. The retired and solitary blackbird flew, occasionally, from her close covert by the side of the Dee, and as swiftly resorted thither again.

Troops of goldfinches, chaffinches, and buntings, repaired to the sides of the mountains in quest of seed. Sparrows passed, and repassed, in every direction, and restless grey wagtails, which seldom perch, and are continually shaking their tails, stopped occasionally for a moment on the loose scattered stones, which, being surrounded with long withered grass, might seem to them like the pebbles of their favourite haunts on the sea-shore. In the distance a plot of arable ground was covered with crows, that rose tumultuously on being disturbed, and flew towards the shelter of a neighbouring wood. Farther on, a company of rooks, which had apparently been long deliberating on the business of the day, were seen flying with an even motion towards the mountains of the south. A party of hen harriers just skimmed across the heath and over the fields of corn, beating the ground like pointers or setting dogs. A kestrel, or wind-hover, hung suspended in the air, with his wings briskly agitated; while along the rugged flank of the nearest acclivity, a brotherhood of ravens occupied their leisure in striking and cuffing one another, in a kind of playful skirmish; and then moving from one station to another, they turned on their backs with a loud croak, as if falling to the ground. Jays and magpies, citizens of the ærial world, were seen fluttering on their way, in striking contrast with a company of starlings that swept along, and missel-thrushes of wild desultory flight. On high, the sky-lark lifted up her voice, warbling and soaring among the clouds, and appearing, as if suspended in mid air: now aspiring to a higher flight, and now again descending a little lower, as if unwilling to approach the dull earth. In a moment her song ceased. A small dark speck appeared conspicuous on the dusky bosom of a cloud. Another moment, and she reached the

summit of the lower mountain. Now the little quivering form was scarcely visible, and now it was lost amid the crowd of surrounding objects. The warbler had reached her nest. But, hark! her tuneful voice is heard again. She darts from the sheltering clod, and soars upwards on rapid wing, and again we are charmed with her music, while the little songstress had herself disappeared.

While thus observing the rapid evolutions of these nimble creatures, I was naturally induced to consider the reason for such a striking difference between the movements of birds and quadrupeds. This undoubtedly originates from the nature of the element in which they move. Birds know better, even than philosophers, the degrees of resistance in the air, its temperature at different heights, and its relative density. They indicate more accurately than our barometers or thermometers, the changes of that volatile fluid. The kite, were it not for his depredations, would be welcomed as the harbinger of clear skies and fine weather; for it is in such that he makes his principal excursions. The returning sea-gull announces to the Icelandic farmer that the snow begins to melt, and that ice is floating down the river.

It is true that they have frequently to struggle against the violence of the wind, but more frequently they borrow its aid. The eagle, soaring above the clouds, quickly escapes to the region of calm and sunshine, while the thunders rolls beneath, and the animal creation is involved in darkness, or exposed to the fury of the tempest. In the short evolution of one day, he can change his climate, sailing over different countries, and contemplating the most beautiful and varied scenes: now looking down on the richly cultivated plains of Italy, and now on the snow-clad Apennines. He, who stations himself on the top of

some high hill, can but faintly discern the exquisite variety of such a panoramic view, and, if we have recourse to art, even our maps, of which the accurate execution is so difficult and tedious, give but an imperfect notion of the relative inequality of the surface of the earth. But aërial natures can successively traverse the fields of air in all directions, and contemplate, at one glance, the mighty whole. Quadrupeds, on the contrary, know in general only the places where they feed; the valley or the plain, the mountain or the forest; they have no idea of distance, nor any desire to push forward their excursions. Hence remote journeys and migrations, are equally as rare with them as they are frequent among birds.

Many species scarcely rest a single moment, while animals require to be frequently recruited. The stag or elk can travel forty leagues in twenty-four hours. The reindeer draws his sledge at the rate of thirty, for several successive days. The camel, the ship of the desert, when urged to his fullest speed, can journey across sandy wastes to the distance of nine hundred miles, in rather more than a week. The swiftest race-horse runs a league in six or seven minutes, but each of these animals soon slackens his career, and cannot long support such an expenditure of strength. The motion of a bird is much swifter. An eagle rises out of sight in less than five minutes; consequently he could perform a journey of two hundred leagues in a day, allowing him to halt at intervals, and to repose throughout the night. An equal degree of rapidity is also assigned to small birds. Migratory ones, most probably, reach the equator in seven or eight days. Adanson saw, on the coast of Senegal, swallows that had arrived on the 9th of October, that is about nine days after their departure from Europe. The messenger-pigeon travels as far in

Persia, during a single day, as a man in seven. The falcon of Henry II., that flew after a little bustard at Fontainebleau, was caught next morning at Malta, and recognized by the ring it wore. A Canary falcon, sent to the duke of Lerma, returned in sixteen hours from Andalusia to the isle of Teneriffe, a distance of two hundred and fifty leagues. Sir Hans Sloane even tells us that at Barbadoes the sea-gulls make excursions in flocks to the distance of more than two hundred miles, and return as the evening draws in. It is therefore evident that birds of vigorous wing, traverse in a day four or five times more space than the fleetest quadrupeds.

Thus wonderfully adapted to their respective spheres of being, innumerable winged creatures were seen to fly above the earth, in the open firmament of heaven, before the evening closed in of the sixth day.

As time passed on, the whole creation experienced a fearful change, and we have now to trace the application of these powers, not only with a reference to the creatures on whom they are bestowed, but as largely ministering to the enjoyment, or the benefit of man.

Let us notice a few of the migratory species of these cheerful and welcome guests, which seem especially designed to awaken thoughts of gladness and thanksgiving.

The subject is a copious one, and though the limits of this work will not permit us fully to enter into its details, we must take a cursory glance at the different periods of their arrival, and the order in which they come.

When a few green leaves appear in sheltered places, and the larch is hanging forth her golden tassels, the Bohemian chatterer is occasionally seen. And then, advancing from the cold and woodless shores of Sweden, myriads of starlings appear in the fens of Lincolnshire.

These emigrants leave us again in October, and return most probably to Sweden in the spring, where their arrival is announced by the leafing of the osier, the elm, and bramble, the blossoming of the wood-sorrel, and the melting of snow in the shade.

Bengal and inhospitable Greenland are equally the resorts of the common wheat-ear. In the one, she ranges among groves of citron; in the other, during summer, beside rills of water. She will also often wander to the most dissimilar places, and wherever the country is rocky, and insects abound, there she delights to dwell. Stationary in some places; in others, especially in the temperate and frigid zones, uniformly migratory. Hence, she passes into Lapland, and visits, in company with innumerable others, the rocky Feroes, and Sweden, where, on her arrival, the farmers begin to sow their grain,—the anemone, and sweet violet to put forth their blossoms, and the fields to be covered with verdure. In England, Eastborne is one of her favourite resorts, because the adjacent hills abound with a small fly that hides in the fragrant blossoms of the thyme. The nightingale, sweetest of British songsters, also accompanies the showery April to build her nest in thickets of acacia. The redstart generally attends her flight; that graceful little bird which announces the blossoming of the tulip, and the flowering of the plum, the marigold, and laurel.

The smaller willow wren precedes her arrival. She reaches us about the 23d of March, and continues her soft twittering till September.

The cuckoo is always a welcome guest. It is delightful to hear her voice in unison with opening leaves and flowers, with warm gleams of sunshine, and those soft winds that come fraught with fragrance across our mea-

dows. The cuckoo has an herald that faithfully informs us of her approach, at whose arrival the meadow car-damine peeps from among the long grass. This is the wryneck, a very pleasing little bird, which is called in Gloucestershire the handmaid of her successor.

Now, the numerous family of swallows, swifts, and land-martins, and the temple-haunting martlets, welcome birds, are seen to hover in all directions. They generally arrive in April, and disappear from the fields of Britain in September and October. Africa seems to be their place of destination, for thousands arrive there about the beginning of November, having accomplished their wearisome journey in less than seven days. How pleasant it is to witness their arrival; to hear the joyous exclamation of, "Have you seen the swallow? now we shall have summer weather;" to watch their circling flight in quest of insects, to hear their glad voices as they dart nimbly through the soft summer air; and as the season advances, to see their citadels forming beneath the eaves of our houses, till at length they are completed, and little bills are seen peeping out and quick glancing eyes watch for the parent bird, when she goes forth to her pleasant labours for their supply.

But swallows are not the only attendants on the showery April. The black-cap, with a sweet wild note, is here; the middle willow-wren of plaintive song; the white throat, the stone-curlew, and grass-hopper lark; the less reed-sparrow; also the turtle-dove, and land-rail, with a loud harsh voice, and the largest willow-wren, that sings on the topmost bough of some high tree.

Now another constellation has appeared in the heavens, other flowers have risen on the earth. April is passing away, and the ring-thrush, or ouzel, is already on the wing. With her, arrive the spotted fly-catcher, the greater petti-

chaps and field-lark. The first, bearing a white or dusky star upon her breast; the second, preceding his female companion, as if to prepare the woodlands for her reception; the third, chiefly affecting Wiltshire, with the southern parts of England, and bringing up her young among high grass or fields of waving corn, where the poppy and the hare-bell grow wild and high, and the timid leveret loves to hide. And with these come the reed-warbler, who hangs her simple nest between three or four tall reeds, or in the spreading leaves of the water dock; and the wood-warbler, a sweet vivacious little songster, that announces his feathery mates at least ten days before they reach the shores of Britain.

May is now here, borne on gentle breezes, and the common bee-eater has been awaiting its coming; but this bird, though well known upon the Continent, rarely visits our coasts. With her the garrulous roller occasionally arrives, but rather from some accidental circumstances attending her migration into other parts, than as an annual guest. Her relative, the hoopoe, may be readily distinguished from every other visitant by the beautiful crest that adorns her head. In Sweden, the country people regard her coming with superstitious dread; and in England, till lately, he who saw her on the green turf beside his cottage door, fancied that disease and sorrow would soon be within. Remember this bird, my reader, if ever you are inclined to forget the mother who lulled and cradled you in infancy. Ancient Egyptian writers mention him as an emblem of filial piety. "He," say they, "takes care of his ancient parents. He cherishes them beneath his wings, and repays all the endearments he has received from them in his tender age."

The common goatsucker, a kind of nocturnal swallow,

generally accompanies his relatives into England, where he makes the woods resound with a loud humming noise, resembling the sound of a spinning wheel. The hobby is seen at the same time; with the grey and red-backed butcher-birds, and the wood-chat.

All these, with several others, arrive successively, and depart for warmer climates. But no sooner have the summer birds deserted us, than a new race appears upon our plains. Fieldfares and throistles fill up their vacant places, with the innocent family of columbine. The short-eared owl is a faithful attendant of brown October; and with her the merlin and the woodcock, the wooded crow, the heavy quail, and grosbeak, punctually observe the period of their coming. When glittering Orion begins to wane, the snow-bunting, an harbinger of tempests, arrives in Scotland, as if to announce hard weather and deep snows.

Such are the migrations of the small birds that visit our island. It is beautiful to observe how punctually their movements are regulated; how they come and go as if guided by an unseen hand; as if they heard a voice, we cannot hear, that seems to chide their stay.

To multiply enjoyment, and to furnish various sources of innocent delight, is evidently a principal design in the construction of innumerable species.

More might be spoken concerning many of these winged creatures, that make the country cheerful, and without whom our blossoming orchards and woodlands would lose their most powerful attraction; but time will not suffice, and, therefore, we shall confine our observations to the delight that is afforded by the warbling voices of these sweet untaught musicians.

We rose one morning early, while Hesperus was yet

visible, and the dew lay heavy on the grass, while a few constellations glittered towards the north, and gray twilight gave unspeakable serenity to the face of nature. The cattle were reposing in the meadows, and as yet no curling smoke appeared among the trees. But the moping owl had not ceased to hoot; for she prefers to utter her boding voice in the gloom of evening, and through the silent watches of the night.

We stationed ourselves beside an aged tree, whose branches waved over the dark and troubled waters that gushed beneath them; but as the morning began to break, we went down into the valley, and again ascended a woody path that led to the summit of a neighbouring hill, listening to the song of the wakeful nightingale, whose sweet mellifluous notes resounded through the woods. He occupied an acacia, that sprung from out a rugged bank, surmounted with aged beech-trees, which in other days kept off the cold east wind from a stately mansion, of which only broken walls and roofless chambers remained. There he concealed himself, where all, beside the gray old ruin, was bursting into life and beauty, and there he seemed to warble an unknown drama, intermingled, occasionally, with the most extravagant bursts of joy and plaintive notes of recollection. Strange, that such a powerful voice can reside in so small a bird; such perseverance in so minute a creature! At one moment he drew out his note with a long breath, now diverging into a different cadence; now interrupted by a break, then changing by an unexpected transition. Sometimes the creature seemed to murmur within himself, and now again his note was full, deep, and clear.

At length all was still; the rushing of a torrent came from a distance on the ear, and the wood-lark which also

loves the silence of the night, poured forth her music. These sounds had scarcely been heard before, so entirely is the ear entranced, when listening to the full deep melody of the unrivalled nightingale.

But now the morning began to dawn; the stern old ruin was brightened by the first beams of the sun, and threw its long gray shadow over the young green foliage of the beautiful acacia. The lark rose high in the air, bearing his song towards the gates of heaven, raising his notes as he ascended, till lost in the immensity of space; yet still his warblings came remotely upon the ear, though the little musician was himself unseen. Presently he was heard descending with a swell from the clouds, still sinking by degrees as he approached his nest, the spot where all his affections were centered, and which had prompted all his joy.

How delightful are the feelings which the song of the lark calls forth, whether we include under this general appellation those birds of this species which soar through the clouds, or delight in the shelter of the woods; or as the titlark, in mossy lanes, and hedges, though distinguished, rather by the variety, than the sweetness of their notes. The accompaniments of the landscape, the golden break of day, the fluttering from branch to branch, the quivering in the air, and the answering of their young, associate with the song of these wakeful birds, an indescribable feeling of hilarity, which tends to elevate the mind to a state of the highest and yet most harmless exultation. How often on the breezy common that rises from my native valley, have I listened to the cheerful notes of the common lark; when, as Walton well observes, he cheers himself and those that hear him, and then quitting the earth, and singing, he ascends higher in the air, till having ended his heavenly

employment, he grows mute, and concerned to think that he must descend to the dull earth, which he would not touch but from necessity. And now the blackbird, and the throstle, with their melodious voices, bade welcome to the early morning, and bodied forth such enchanting notes, as no instrument, nor sweet sound of warbling voice could imitate. Other wakeful birds were heard in all directions : the laverock, the titlark, the little linnet, and honest robin, who loves mankind both alive and dead. The note of the contented cuckoo was also heard, monotonous, yet cheerful. It is a note, which more than any other of the feathered race calls up the recollections of early youth. Something of melancholy is occasionally blended with it, but it is a melancholy that may lead to a review of our past lives, and the lives of those with whom we have been acquainted. While endeavouring to recall the changes, which a gradual progress from childhood to youth, and from youth to manhood, has occasioned in our friends, we are taught to place less confidence in ourselves, and in those connections which are rapidly being dissolved.

Another train of images is also associated with the voice of this early bird, and those of a nature peculiarly pleasing.

I was passing some years since, through the Pass of Llynberris, one of the most mountainous districts in North Wales, misty mountains lifted their bold foreheads to the clouds, and numerous lakes appeared, at intervals, among the gray brotherhood of rocks. There was something of novelty, as well as of melancholy in the scene. Not a moving object met the eye, not a sound was heard, excepting the hollow murmur of the wind, and the rushing of distant torrents. There was nothing to recall the thought of home, no little flower the eye could rest upon

with pleasure, no rivulet sparkling to the sun, and leaping from crag to crag. All around was one enormous mass of broken rock. In a moment the note of a cuckoo sounded from the depth of a ravine, perhaps, some little stream had found its way thither, and a few wild flowers grew beside it. But that note spoke of home, and the green fields of England, and a thousand indefinable emotions rushed upon the heart. It was like a distant voice resounding from the scenes of childhood, and transporting the listener, as with a magical power, from the stern and rugged mountains of North Wales to the pleasant fields of his native land.

It seems strange that a single monotonous reiterated word, should produce such powerful effect upon the mind. But it is from association that the cuckoo possesses her power to charm: while she recalls to our remembrance all the delights of spring, its rolling clouds, and warm gleams of sunshine, its meadows glowing with beauty, and hedges, over which the wild rose, and the honeysuckle, throw their graceful drapery. How often amid the beautiful glens, that surround my quiet dwelling, filled with sheep, adorned with the gayest flowers, and watered with streams; beside which, the daffodil, and marsh-marigolds droop their gaily tinted heads, have I listened to the voice of this transient guest; and how often in the enthusiasm which she can so well inspire, have I repeated the exquisite production of the muse of Logan:

“ Hail beauteous stranger of the grove,
Thou messenger of spring;
Now heaven repairs thy rural seat,
And woods thy welcome sing.

What time the daisy decks the green,
Thy certain voice we hear;
Hast thou a star to guide thy path,
Or mark the rolling year?

Delightful visitant ! with thee
I hail the time of flowers ;
And hear the sound of music sweet,
From birds among the bowers.

The schoolboy wandering through the wood,
To pull the primrose gay ;
Starts the new voice of spring to hear,
And imitates thy lay.

What time the pea puts on the bloom,
Thou fliest the vocal gale,—
An annual guest in other lands,
Another spring to hail.

Sweet bird ! thy bower is ever green,
Thy sky is ever clear,
Thou hast no sorrow in thy song,
No winter in thy year.

O could I fly, I'd fly with thee,
We'd make with joyous wing
Our annual visit o'er the globe,
Companions of the spring."

Seated on the summit of a rocky acclivity, we listened with indescribable pleasure to the sounds and voices that came from the valley below. The chorus of the groves was at its height; the clamours of a rookery resounded from a row of elms that encircled a moated mansion; and from a neighbouring farm-yard, the cries of its feathery inhabitants were distinctly heard.

Birds, the favourites of man, are found wherever he fixes his abode. They delight him with their agile movements, and charm him with their warbling voices. No place is so lonely but they seek to make it cheerful; no peasant's cot so far away, but they hasten to sing beside it! The goldfinch delights in sandy plains, the lark in ploughed fields; the nightingale in woods, and by the side of water. The bulfinch, whose sweet note is often heard in

apple orchards, covered with white blossoms, chooses to sing in a wild rose, the branches of which droop over some clear stream. The thrush, the yellow-hammer, and the greenfinch; in short, every little singing bird, has its favorite resort. The golden-crested wren prefers the shelter of the honeysuckle; the linnet, wild and solitary glades.

The missel is equally celebrated for the compass and variety of his vocal powers; the blackbird, for the cheerful notes with which he gladdens the field and wood; his tones are deeper and more clear than those of any other singing bird. They who wish to hear the blackbird in all his melody and sweetness, should listen for his song after a heavy thunder shower. I have often heard it when other birds seemed afraid to renew their strains, as if they dreaded the returning roll of the deep thunder, or the heavy rain-drops loudly pattering on the leaves.

We have spoken of the nightingale as singing through the night; but there are also other little choristers who delight the hours of silence and repose. The wood-lark begins her vespers, as soon as the evening closes in; she warbles, suspended in the air, and hence she has been mistaken for the nightingale. The lesser reed-sparrow prefers the same still season, and sings among reeds and willows. The sedge-bird also awaits the approach of evening, and pours forth the sweetest melody. When she drops her song, the throwing of a stone, or clod into the bush, immediately arouses her; or, in other words, though she sleeps occasionally, yet, as soon as she is awakened, she resumes her strain. The grasshopper-lark chirps all the night during the summer months; and he, who is much abroad in the beautiful gray evenings of spring and summer, frequently hears a nocturnal bird passing by, on the wing, repeating a short quick note. This

is the stone-curlew. It is noticed by White, in his elegant history of Selbourne, as flying over, or near his house, every evening, after it was dark.

The song, if such it may be called, of the common goat-sucker, resembles the whirl of a large spinning wheel, and comes at intervals upon the ear, in the deepest solitude of our native woods. It forms a striking contrast to the note of the grasshopper-lark; which is often heard at the break of day, among green shady lanes, and across the village common. Nothing can be more amusing than the whispers of this little bird, which seem close at hand, when, perhaps, at the distance of one hundred yards. The country people laugh when you tell them that it is merely the chirping of a bird, and his movements, as if conscious of their ignorance, are very peculiar. He will skulk in the thickest part of the hedge, and sing at intervals, and then, if disturbed, run to the other side, creeping like a mouse among the bushes, though never venturing into sight. But early in the morning, when scarcely the wakeful labourer is abroad, he will sing on the summit of a leafless spray, as if confident of security. The note of the red-start is extremely pleasing. Sitting placidly on the top of some tall tree in a village, he sings from morning till night, for he prefers the society of man, and seems to delight in pouring forth his minstrelsy, where it can be the most admired.

There is still another little bird, rather celebrated for his affection than his melody, but which has, nevertheless, a note of peculiar sweetness. This is the robin red-breast, the well-known friend of man. Others of his feathered companions are louder, and more varied in their melody, but the voice of the robin is soft and tender.

The wren and red-cap, though very diminutive, are yet

distinguished as minstrels among their warbling brethren. The former, which is often called the mock-nightingale, has a full, deep, and loud clear pipe, though generally of short continuance. Yet, when she sits calmly, and engages in good earnest, she pours forth such a variety of gentle modulations, and soft wild melody, as often brings to remembrance the woodland-loving Jacques,

“ Who tuned his merry throat
Unto the wild bird’s note,”

But man alone is attentive to the voices of the feathered tribes. It is for him that their soft warblings, or cheerful notes, resound through the woods and hedges. The stately deer does not regard the complaining nightingale, when standing to drink in the running stream that flows beneath the hawthorn in which she has concealed herself. Nor does the unwieldy ox, nor the innocent sheep, cease feeding, while the blackbird, which has been robbed of her young, pours forth the bitterest notes of recollection, or the most plaintive accents of despair. The human heart can alone derive pleasure from the sweet harmony of nature, from the warbling quire, or the universal chorus of the groves. And as every spot has its own appropriate musician, so every ærial musician has also a voice adapted to the season of its appearance. The loud clarion of the cock, or the lively carol of the wakeful lark, calls the husbandman to the labours of the day, and it may also convey an important lesson to the heart. In like manner the vivacious thrush, which in France faithfully accompanies the autumn, summons the rustic vine-dresser to the joyous business of the vintage, and in the Arctic regions, the loud cry of the returning sea-gull invites the expecting inhabitant from his solitary abode.

It seems to me that the Creator has thus diffused this exquisite harmony of sounds throughout his visible creation, in order that those who are capable of understanding and appreciating them, may rise from the beauty and variety discoverable in his works, to adore, and to acknowledge Him who creates and sustains them. But it is not only among animated beings, that soothing and delightful cadences are often heard; the whispers of the gale, the murmur of the water, the rustling of aspens and of poplars, or of reeds shaken by the wind,—produce a variety of sounds that excite the most interesting associations in the mind. And these, with the singing of birds among the branches, the sounds of cheerfulness that ascend from our fields and meadows, and the thousand voices that speak from within the bushes, form, altogether, an harmonious chorus, a loud resounding anthem of praise to Him, who sitteth above the circle of the heavens.

Pass we now to those species of water-fowl, which annually frequent the shores of this, and other lands, in accordance with the necessities of man.

An indescribable feeling of majestic tranquillity, is inspired by the wild and stupendous scenery which characterises the north of Scotland as well as the Orkneys, and the Shetlands. But how much is this feeling heightened, and what trains of pleasing and solemn thought crowd upon the mind of him, who regards the whole, not merely with an eye of taste, or as solely ministering to intellectual pleasure, but with a reference to those living harvests of inexhaustible bounty, which the Deity bestows upon them.

Nor is it possible to contemplate these stupendous scenes without mingled emotions of sublimity and pleasure. He, who traverses the exotic regions of the globe,

witnesses on every side the most abounding instances of lavish beneficence, and love: amid the luxuriance of nature, he is in danger of forgetting that Great Power, who gives animation to these lovely and imposing scenes. He, on the contrary, who sojourns within the arctic regions, or on the islands that adjoin them, more clearly discovers, amid the stern and rugged features of those wild solitudes, the footsteps of unerring wisdom. He may observe around him a brave and hardy race of men, who are subject to severe privations, but whose privations are so tempered with mercy, that hard must the heart be, which does not acknowledge the care of a kind Father.

The shores which they inhabit are, indeed, sterile and difficult of access; the seas are stormy, and the rocks, that emerge from them, are fraught with danger, yet they afford the safest and most secure harbours; migratory fish resort thither in myriads, and their summits resound with the cries of the feathered inhabitants. Take, for example, the Feroe islands. These, as well as those of Caledonia, abound with innumerable water fowl. They consist of seventeen lofty volcanic rocks, which are faced with tremendous precipices, rising abruptly from out a raging sea, and divided by rapid currents. Puffins, and razor-bills, and auks, are observed at certain seasons of the year to nestle in great numbers at the base of the loftiest crags, as the shortness of their wings prevent them from ascending to the summits; while the higher ridges, and the lofty pinnacles of those majestic rocks, are covered with the arctic, black-headed, and heron-gulls, fulmars, wild geese, and swans; the latter are vernal passengers towards the north, in company with eider-ducks, cormorants, and

gannets. Each of these inhabit at certain seasons, the most rocky and uncultivated districts, while such birds as delight in shady groves, and meadows watered with streamlets, are unknown in those wild regions, for although the surface of the rocks, which consist of a shallow soil, produces barley in abundance, not a single tree beyond the size of a juniper, or stunted willow, diversifies the cheerless aspect. The exports of the inhabitants, therefore, chiefly consist of goose quills and feathers; with oil and eider down.

The geography of plants has been accurately defined. Animals too are assigned with unerring precision to different latitudes; one species is precluded from moving to a distance, by the slowness of its motions, others are equally prevented by seas and mountains from changing their places of abode. But why those creatures, which are denizens of air, should be restricted, as if by an imperious necessity, within prescribed limits, is a question, that can only be solved, by considering it as an effect of that unerring Wisdom, which has so mercifully arranged the whole creation, with an obvious reference to the comforts or necessities of man.

Those who contemplate the light and airy movements of innumerable water-fowls, their often graceful forms, and the rapidity, with which they wing their flight from one rock, or marshy station, to another, along the margin of rapid rivers, and beside high mountains, covered with heath and furze, might conjecture, that they were free to range at will; but such is not the case. The mode of life, the habits, the economy of these wild creatures, neither result from choice, nor inclination; they are the necessary effects of a peculiar structure, and organization; nor do

the subjects of them ever seek to infringe these just, and necessary laws.

Viewed with a reference to this arrangement, how wonderfully are many species of these comprehensive tribes, restricted within certain limits !

The common razor-bills, inhabit Iceland, Greenland, and the gloomy promontories of Labrador. They extend in the northern hemisphere along the shores of the White Sea, and those of Northern Asia, diverging from thence to Kamtschatka, and the Gulf of Ocholsk. They delight in the sternest fastnesses of nature, and are the only species of the genus that frequent the Baltic, where they are found in considerable numbers. Their eggs, deposited by hundreds, along the shores, and on the rocks, are used as food, and eagerly sought after by the hardy natives, who climb the most terrific precipices in search of them.

The sea-dove affects the northern oceans of Europe and America, and is also seen by mariners, either on the masses of floating ice, which often impede their navigation, or else skimming the surface of the billows, and diving with inconceivable rapidity. Her relatives, also, abound in Newfoundland, where their appearance indicates the coming of the ice. Such is also the case at Baffin's Bay, where myriads are seen swimming in the bays and rivers, together with vast assemblages of whales and unicorns.

Providence, in assigning the arctic, and the northern, the tufted and ancient puffins to the Polar regions of the globe, to Kamtschatka, and the Kurule islands, and in permitting them to migrate only to certain distances, has reserved an invaluable gift for the inhabitants. Let him who doubts the accuracy of this statement, repair to the

Needles of the Isle of Wight, and then carry back his thoughts to the remote period, when that beautiful island, with her plains and valleys was uncultivated and inhabited by fishermen and hunters, who principally depended on the visitations of the sea fowl, and the annual deposits of the ocean.

In speaking of this interesting species, we have again to notice another and most striking instance of that inexplicable faculty, which regulates the movements of the winged race. These birds commit themselves to the guidance of the waves, pass the whole day in fishing, and return at night to the rock, which they left at day-break, though that rock might, perhaps, scarcely emerge above the water when they left it, and be covered with dancing breakers in the evening. But, not only are the eggs valuable to the inhabitants; they clothe themselves with the skins, for these when sewed together form light, elastic, and comfortable garments.

Thus does the great Creator of the universe apportion his gifts to the exigencies of his creatures. He bestows on the most sterile, or uncultivated regions, innumerable hosts of migratory birds, some yielding oil, with which to supply their lamps, and others that are clothed in soft plumage, and downy skins, that the inhabitants may be defended from the cold.

With the same obvious design the family of Stariki inhabit the northern parts of Asia, and America. One of these, the parroquet-auk, of Pennant's British Zoology, is the most unsuspecting, and, perhaps, stupid of the feathered race. They inhabit the dreadful rocks of Kamtschatka, in common with those of Japan, and the western shores of America, where, independently of the useful purposes to which the eggs and feathers are applied, their stupidity is

very beneficial to voyagers sailing by night in those dangerous seas. Many a gallant vessel has been saved from shipwreck, and warned of the neighbourhood of dangerous rocks, by the flying of these simple birds on board.

The lofty promontory of St. Ebb's Head, and the Isle of Man, is much resorted to by penguins, auks, and gorfous; the Stoma of Ptolemy also, a small island situated about two miles from Caithness, is annually frequented by myriads of this valuable species. About thirty families occupy this insulated spot, and chiefly subsist upon the eggs. But the migration of these wandering birds is not confined either to the Hebrides, the Orkneys, or remotest Shetland; they traverse almost every coast, and inhabit the northern shores of Europe, and America. In some inhospitable regions, they serve both for food and raiment; and hence the natives eagerly pursue them in their boats among the breakers. It is a curious circumstance that while they are attached to the northern portions of the globe, they are never seen beyond soundings; seamen, instructed by this extraordinary fact, often direct their progress according to the movements of these birds, and thus much danger is avoided in unknown seas. So in modern times, sailors pay respect to auguries, as, according to Aristophanes, those of Greece did, two thousand years since.

“ From birds in sailing, men instruction take,
Now lie in port, now sail, and profit make.”

This species, as I shall presently have occasion to observe, are wonderfully adapted to their respective spheres of action; while steering along the shores, they principally

subsist on the lump-sucker, and father-lasher, but when their nests are built on high rocks, or beetling crags, the rhododendrum *Kamtschaticum*, a beautiful little alpine plant, that throws its graceful blossoms over the weather-beaten-stones, suffices to support them.

Let us pause for a moment to consider the wonderful construction of the lump-sucker, and father-lasher, and of that solitary alpine plant, which mantles the wildest rocks.

The lump-sucker, then, and father-lasher, are admirably adapted to their peculiar mode of life. The pectoral fins of the former are large and broad, nearly uniting at the base, in such a manner as to form a kind of funnel. Beneath this, appears an oval aperture, surrounded with a soft muscular substance, beautifully edged with small thread-like appendages, which act the part of numerous claspers, and enable him tenaciously to adhere to rocks and stones. Such even are his powers of adherence, that when thrown into a pail of water, he has attached himself so firmly to the bottom, that on taking him by the extremity, the whole pail, though capable of containing several gallons, has been lifted up without removing the fish from his hold. The utility of these appendages to a creature inhabiting the rocky shores and turbulent seas of Greenland, and generally diffused throughout the northern ocean; their unutility, and consequent omission in such as frequent still lakes and inland seas, is unquestionably most remarkable. The father-lasher presents a striking instance of mechanical contrivance in the means of defence with which his Creator has endowed him. A general inhabitant of the rocky shores of Britain, lurking among stones and seaweeds, and swimming with great velocity in the stormy seas of Greenland and Newfoundland, he presents his

formidable head in opposition to his enemies. This part is large in proportion to his bulk: it is covered with spines, and these are capable of being so erected as effectually to intimidate any ordinary enemy, by the swelling of his cheeks and gills, to an amazing size.*

The solitary alpine plant, the rhododendrum Kamtschaticum, which throws its graceful blossoms over the weather-beaten rocks, is equally deserving of a moment's observation. The flowers are rose-coloured, and nearly two inches wide, each on a long, hairy stalk; hence they are well adapted to receive the sunbeams; while the procumbent stems embrace the rock from which they spring, and are consequently not exposed to be torn off, by contending winds.

Thus admirably is this plant adapted to the stormy regions of the farthest north.

To return from this digression to the more immediate subject of our section, we may farther notice that the black-billed auk, of Pennant's Arctic Zoology, is not less important to the inhabitants of those sterile regions than penguins, auks, and gorfous. Clothed in their skins, and supported with their flesh and eggs, the Greenlanders goes forth with renewed strength to his dangerous labours on the ocean. Thus also the fine ash-coloured down of the Chiloe penguin which inhabits the Archipelago of Chiloe, is manufactured into various garments; and thus also, other migratory species furnish to the aborigines of the Cape of Good Hope, Terra del Fuego, and the Antarctic seas, both eggs and feathers.

Gannets are abundant in the Hebrides. Their size, their snowy plumage, their easy flight, and precipitate

* The Sea-slide Companion.

plunge, readily distinguish them, among almost every other species of water-fowl. They resort in myriads to the northern parts of Europe, Asia, and America; and here we may again remark the beneficence which is every where distinguishable, in assigning this valuable species to those regions where the natural productions of the soil are least abundant; where there are neither green fields nor woods; neither flocks nor herds.

These wandering birds arrive early in the spring and retire during autumn from the islands of the North. Perhaps, if their migrations could be accurately traced, it would be discovered that they join their companions on the coast of Florida, the general meeting place of such as come from the northern regions, and traverse the Atlantic ocean. Inseparably attendant on the progress of the herrings, they are hailed by fishermen as harbingers of an approaching shoal. Now mark the abundance which their arrival confers on the inhabitants of regions not far distant from our own shores. Many thousand birds are annually captured by the inhabitants of St. Kilda, besides an innumerable quantity of eggs. These spoils are carefully stored up in pyramidal stone buildings, and covered over with peat ashes. The craig of Ailsa, and Bass Island, are also their favourite haunts, and during the months of July and August such innumerable crowds resort thither, that every ledge and open space is so completely covered, that a passenger can hardly set down his foot without treading on them. Nay, such vast multitudes also fly above his head, that they seem in the bright sunshine like a heavy cloud, and so great is their clangous noise, that he can scarcely distinguish the voice of a companion, though standing by his side. Those who look

down from the summit of a lofty precipice on the incessant toiling of the waves beneath, perceive innumerable birds of various kinds, either swimming, or in search of prey. Those who sail around the island and survey the impending cliffs, discover on every crag and fissure, winged creatures of various shapes and sizes; and lastly, those who, far off at sea, behold the flocks that fly around the island, compare them to a swarm of bees.

In all well organized beings, instinct displays itself by a chain of consistent habits, leading to their preservation; and this internal sense directs them to seek whatever may contribute to the support, and eventually to the comfort of life; but proverbially stupid, gannets, though well able to exercise their powers, both in the air and on the water, rarely avoid the dangers by which they are surrounded, and thus become an easy prey to the adventurous fowler. Admitting that these valuable birds are designed to afford a plentiful supply of food to the inhabitants of the Arctic regions, this indolent security is another proof of the beneficence of the Creator. Were it otherwise, those who have to seek them along the edge of dizzy precipices, or above fierce breakers, would have little chance of securing their prey. We discover no analagous disposition in birds of rapine, nor in such as affect our own groves. It is undoubtedly a peculiarity which has for its object a specific purpose. This peculiarity is still more important than might appear at first, because the gannet, as befits the long aerial journeys which he has to make, is peculiarly swift of wing, and because the skin is capable of being inflated like a bladder; hence the specific gravity of the bird is considerably diminished.

Terns, or sea-swallows, as the species is beautifully denominated, resemble those from whom their name is de-

rived, in the length of their wings, and forked tails, and in continual circling over the surface of the water. As the land swallow flies swiftly across our fields, and round our dwellings, in search of winged insects, so these nimble creatures circle, and glance rapidly on the liquid plains, and catch the little fish that play above the surface. Their flights seem to be impelled by starts of momentary caprice, or by the sudden glimpse of their fugitive prey. Their voices are loud and shrill; they are ever clamorous and restless, and when occupied with the care of their young, the fowler is sometimes nearly stunned with their cries.

Large flocks arrive on the coast of Picardy in the beginning of May. Some remain upon the beach, while others advance further, in quest of inland lakes; but in every place they subsist on fish, and even snatch the winged insects that fill the air. The report of fire-arms, so far from intimidating, seems to attract them. Does this proceed from blind security, or is it given, like the ganpet's unsuspecting temper, for a specific purpose? Let him who observes the instincts of the animal creation, with an especial reference to the design of Providence in each; solve this interesting problem!

Unlike the razor-bill and sea-dove, this species are not confined to the northern ocean; they "cross the liquid weight of half the globe," and alight on almost every shore; they extend from the seas and lakes, the great rivers, and bold coasts, of the northern regions, as far as the vast boundaries of the Southern ocean.

Gulls, clamorous and voracious birds, keep in flocks on the sea-coast of this, and almost every part of the known world; though, perhaps, most common in those wild regions, where the traveller sees only untrodden

wastes, where none of the domesticated species meet his eye, and where no human voice answers to his call.

Such are the frozen borders of the two Polar zones, and there their eggs are strewed by thousands on the shores. In Greenland, especially, their numbers are incalculable; and at Hudson's Bay they remain stationary through the winter, as if designed to supply the loss of storks and geese, of ducks, teals, and plovers, which migrate in autumn towards the south. There they furnish an abundant supply of food; and in the islands of the Antilles, they form, during one portion of the year, nearly the sole support of the savage aborigines. When plucked and placed upon the fire, the burnt feathers form a crust, and thus the birds may be kept for several days. This is the more extraordinary, as in that country flesh generally becomes unpalatable in the course of a short time.

Among the many winged creatures of various instincts and construction, that throng the northern oceans, petrels are perhaps the most adventurous in ranging to the greatest distance.

“ They sweep the seas, and as they skim along,
Their flying feet unbathed in billows hang.”

In the remotest portions of the globe, through every sea that navigators have explored, these fearless birds seem to await their arrival, and even to stretch far beyond them into more distant and stormy latitudes. They may be seen in various directions, sporting securely, and even gaily, on that element which is often so terrible to even the most intrepid: as if the Deity designed to teach mankind that the instincts which he allots to the inferior

orders of creation, frequently exceed in their effects, the combined operations of both art and reason. The stormy petrels, smallest and best known of this peculiar genus, are generally silent in the day; they seem aware of tempests, and may be seen skudding rapidly above the billows, as if anxious to secure a place of refuge. Should they happen to perceive a vessel in their distress, they hasten immediately beneath her stern, and then the awe struck mariner hastens to furl his sails, and prepare for an approaching storm. The various uses of the petrel family are well known; their eggs are valuable, their feathers in great request, and they are also so full of oil, that the Feroe islanders draw a wick through the body of the bird, which, being lighted at one end, answers the purpose of a torch.

Equally important is the numerous family of barnacles to the heaths and marshes of the arctic regions, to the shores of Coromandel, Terra del Fuego, and New Holland; as their vernal and autumnal migrations are to the more temperate shores of France, and Holland, of Germany, "the farthest Thule," the Hebrides, and Orkneys.

Surely it is no small proof of the goodness of the Creator, that the annual visitations and the instincts of these migratory species are adjusted to the local disadvantages of the countries they visit. Ducks of various descriptions are diffused throughout different portions of the globe, but it is solely within the arctic circle, and along the northern shores, that their vast squadrons are seen spreading on the plains, and inhabiting the sterile rocks, or filling the bogs and creeks. Wily in their habits, and apparently conscious of the dangers that surround them, these useful creatures are more active during the night than in the day: they feed, they journey, they arrive,

and depart chiefly in the evening, while such as are seen occasionally in broad day-light have been disturbed by sportsmen. When night draws on, the rustling of innumerable wings discover their onward course ; and so long as the season continues mild, aquatic insects and small fishes, frogs that have not yet crept beneath the mud, seeds of bull rushes, and other bog plants, afford an abundant supply of food. But towards the end of December, or early in February, if the great lakes are frozen over, they remove to the shores of rapid rivers, or to the shelter of ancient woods, in order to procure acorns. There they continue to supply the wants of the bordering inhabitants, until the frost becomes severe, when they suddenly disappear, and do not return till the thaws of February, at which time they arrive with the south winds, though in smaller numbers. This difference may be accounted for, by the losses which their aërial squadrons sustain during the period of their perilous migration. Yet their numbers, though almost incredible, are admirably proportioned to the dangers that await them, as well as to the different degrees of fertility in the regions where they respectively sojourn. When spring commences, and flowers deck the earth, they speed to the northern regions, where they raise their young and spend the summer : in Lapland, especially, that cold, sterile, inhospitable land, a traveler might conjecture, that if they did not dispossess the inhabitants, they would at least fill up their place. As soon as these wandering people depart in their summer excursions to the mountains, vast flocks of wild geese and ducks fly towards the western sea ; when, on the contrary, the aborigines return in autumn to the plains, the birds have already retired. Perhaps, as no country is more desolate than Lapland, less fertile in fruit and grain, more

rocky, savage, and unsusceptible of culture, so in no other is there such an abundance of water-fowl. The rivers are literally covered with them, and along the margin of their rugged shores, and in the lonely places of those wild regions, the nests and eggs are so plentiful, that it is difficult to pass without crushing them.

In like manner, shovelers and pintails, teals and mews, mergansers, harolds, lobe-ducks, and eiders, with various others of the same family, are very beneficial to the inhabitants of Northern Europe and America, New Zealand, Holland, and South Wales. Of one we read that they frequent the marshes of Northern Europe and America; of another, that the natives of "far distant Labrador" annually await their coming; of a third, that their arrival affords a never-failing supply to the expecting inhabitants of various parts of Britain, Ireland, and the stormy Hebrides; of a fifth, that beside the sea of Okotsr, their numbers are so great, that each of the bordering aborigines can easily obtain a considerable number; of another, that the Greenlanders pursue them with darts, because their flesh is valued as food, and their skins are made into warm and comfortable under-garments, while the beautiful white down which covers their breast, as with a shield, is highly esteemed for its lightness, elasticity, and warmth. Of all, it is certain, that they are diffused in exact accordance with the wants of the inhabitants, while such of their kind, as inhabit the warmer regions of the globe, are comparatively few.

Who is there that does not acknowledge in this arrangement the hand of a Being supreme in power, unrivalled in benevolence? These cold, inhospitable regions afford little subsistence to the inhabitants; their crops of grass are scanty, nay, in some, herbage is unknown, and the rocks

yield no pasturage for cattle. Clouds and tempests gather over them, and their long, cheerless nights forbid the exercise of much industry. But the Most High, though he does not permit them to enjoy fruitful seasons, has not left them without witnesses of his beneficence. The sea pours in her annual banquets, as we shall presently have occasion to observe, and myriads of sea-fowls resort to their sterile shores. Who, I would again inquire, does not recognize, in this wonderful arrangement, the hand of the Supremely Wise, of Him, who remembers the Smolensko in his solitary dwelling—who thinks of the savage Samoiede, and blesses him—who forgets not the forlorn Obyean on the furthest verge of habitable nature, on whom the true light of religion has never dawned, and who sees, as through a darkened glass, the God who has created and sustains him.

Nor are the dissimilar family of divers, guillemots, grebes, and finfoots less important in the regions, to which they are assigned. Northern-divers prefer the Arctic shores of Europe, Asia, and America, while they are apparently unknown in the warmer regions of the globe. The reason of this is obvious. Their eggs, though invaluable to the natives of cold and sterile lands, would be disregarded by him, who walking beneath the shade of citron and orange groves, sees around him all the glory and luxuriance of the tropical regions. We find, accordingly, that they abound in the northern portions of the world, and that their visits are adjusted to the necessities of those, among whom they are appointed to sojourn.

Guillemots, banished from the sultry regions of the line, inhabit, in like manner, various parts of the northern hemisphere, visiting the more temperate countries on the approach of winter, and remaining stationary, till they

have reared their young. The lesser species abound among the sheltered bogs on the coast of Scotland, extending even to the Orkney and Shetland islands, and especially resorting to the Frith of Forth. To these they almost exclusively confine themselves, or rather, they are sparingly scattered over the southern parts of the kingdom. This arrangement, while it shows that they are properly natives of the Arctic regions, and that they only retire from the frozen seas when unable to struggle against the progress and encroachments of the ice, affords a valuable supply of fresh provisions to the expecting inhabitants of those bleak and sterile countries.

The black, the smaller and foolish guillemots abound in equal numbers on the bold headlands of the Arctic regions, as also on Britain's most rocky shores. The first, called lasgar, as when its warning voice is heard across the billows, the sailors reef their sails, and prepare for an approaching storm, inhabits the northern parts of Europe, Asia, and America; it also affects the towering summits of the Bars, in the island of St. Kilda, the rocks of Llandudno, in Caernarvonshire, and the islets southwest of Anglesey. The second, congregates in myriads during the winter months along the Scottish bogs, on the Orkney and Shetland islands, and around the Frith of Forth, though comparatively rare on the southern coast. Thus contented with a boreal station, and thereby evincing that they are properly natives of the north, they retire from the icy seas, merely to such places in their neighbourhood, as being unimpeded by the ice, may afford them a plentiful supply of sprats; hence they never migrate from the shores of Britain towards the regions of the line. The third, on the contrary, are common to this country. Here they deposit their eggs on the ledges of the rocks; here

they bring up their young, and then depart for some more southern climate. This migration invariably occurs about the time when the smaller guillemots and black-billed auks are preparing to supply their places ; while the reverse occurs as we approach the line. Thus wonderfully has the Great Creator of the Universe provided for the wants of his expecting children ; by never withdrawing one of his needful gifts, till another is provided to supply its place.

Grebes also, well known to naturalists by those beautiful and silvery white muffs, which unite the soft closeness of down, the elasticity of feathers, and the lustre of silk, are not without their use in the peculiar situations, to which the hand of the Creator has assigned them. Their skins, when sewed together, supply warm clothing, and their eggs, deposited along the northern shores, point out to the hardy natives, that the same benignant Being, who directs at another season the movements of the finny multitudes that collect in their seas and rivers, remembers the privations of his creatures, and remembers them in mercy.

Time would fail me, were I to tell how admirably other species are assigned to various portions of the globe ; that the flights, the instincts, and construction, of different winged tribes are wonderfully adapted to compensate the local disadvantages of their prescribed haunts ; how one species furnish a constant supply of oil in those stern regions, where darkness prevails for half the year, how another arrive exactly at the time, when certain migratory fish forsak the lakes and rivers, and how throughout the whole extent of the vast northern regions, the arrival and departure of each species are accurately prescribed, how uniformly they observe the period of their coming, and how wonderfully they are designed to supply the wants of man.

Now observe how well these creatures are constructed to answer the purposes for which they are designed; how fitted either to sail upon the water from one inland station to another, or to pass on rapid wing over the deep sea; and how admirably their plumage answers the double purpose of lightness and warmth.

In such as swim, the legs are short, and placed not far from the tail; the toes are four in number; three before, united by a web, and one behind, which acts at will, and is raised a little above the others. Take for example the foot of a common duck, and you will readily comprehend its adaptation to a watery element. A swimmer does not open his fingers so as to let the water pass through; but closes them together, and thus presents a broad surface, with which to beat back the stream; nor does a rower propel his boat by means of perforated oars. That which reason points out to man is exemplified in the water-fowl. We may also observe that the toes are so constructed as to present, when striking backwards, a broad hollow surface to the stream; and that, as they gather in again for a second stroke, the surface immediately contracts, and thus the progressive motion of the bird is not in the least impeded.

And as the toes are webbed in the most convenient manner, so are the legs adapted for gliding swiftly through the water. They are uniformly short; otherwise they would act at a disadvantage, and the labour of moving them would be proportionally great. For this reason, the very few birds, that have long legs and webbed feet, never make use of them in swimming; they serve rather as a broad base in order to prevent them from sinking, when they walk on the soft sand.

Thus well-constructed for moving on the stormy

surface of the ocean, though in a great degree precluded from wading along its shores; their stay on land is generally short. They build their simple nests by the sea-side, and rear their young upon the water; and in order to obviate any inconvenience that might result from the dampness of their habitation, the little creatures are clothed with soft down. The parents, also, have a closer, and a warmer plumage than birds of any other class; and this plumage neither mats, nor readily imbibes humidity, when exposed to the air. They are further provided with a reservoir for secreting oil, and much does this conduce to their comfort, and well-being. And as many of these creatures principally affect the northern seas, so are they also encompassed with fat, which, by augmenting the internal heat, and keeping off the external cold, enables them to endure the hardships, to which they are incessantly exposed. It answers also a double purpose, partly to form a barrier between the water and the vital fluid, so as to prevent that general chilliness which an immediate contact would produce, and partly for the reason I have just assigned.

We may also briefly notice that the spoon-shaped bill of the goose, and its numerous relatives, readily enables them to collect their food from slimy pools, or amid the soft and liquid substances, with which it is generally mixed. Examine for instance, the bill of one of those wild creatures, that annually frequent our coasts. The inside, towards the edge, is thickly set with sharp pointed prickles, which, although they look like teeth, are not for the purpose of mastication as those of quadrupeds, nor yet as in fish, for seizing and retaining their prey. They serve as filterers. By means of them a duck examines every mixture that is likely to contain her food. She draws the liquid, or semi-

liquid substance through the narrow interstices of the sharp pointed prickles in her bill, catching, as the stream passes, whatever it may happen to bring, that is agreeable to her taste, and easily rejecting all the rest. "Now," as Paley beautifully remarks, "suppose the purpose to have been, that the creature might separate, for her own use, those few particles which suited her fancy, what, more artificial, or more commodious, could have been designed, than this natural filterer."

It has also been observed, that the bills of this species are provided with large nerves; that they are covered with a skin, and that the nerves run down to the extremity. This arrangement readily enables the bird to choose, and to distinguish with great accuracy.

The same peculiarity is obvious in every kind of water-fowl, that collects its food from off slimy pools.

Here then, we have a creature exactly adapted to answer a specific purpose in the great economy of nature. Legs and webbed feet for wading; a reservoir of oil, with which to dress and plume its feathers, as a means of keeping out the wet: bills for suction, and a natural covering, by means of which it is defended from the cold.

Nothing analogous is observable in land birds; but the water-fowl of which we speak, are designed to answer many important purposes to man, in some of the most inhospitable regions of the globe, and they are consequently well adapted to their assigned haunts.

There are also other contrivances, which obviously refer to peculiar localities, and to the wants, and relations, which subsist between the configuration of one or more parts. In the duck a web foot, and pliant neck, a graminivorous stomach, and oiled feathers, concur in one design,

that of supplying the wants of an aquatic fowl, who seeks her food in sedgy places. Begin with any one of these peculiarities of structure, and observe how the rest follow. The web-foot qualifies the bird for swimming, the spoon-bill enables her to feed. But how is a creature, that often floats on pools of water to seek her food beneath the surface, except by the aid of a long neck? A long neck is accordingly given her. Again, a warm-blooded fowl, which is designed to brave the severity of cold, requires a peculiar defence. Such a defence is furnished to the duck by the warm soft muff in which she is wrapped. But all this outward apparatus, would avail nothing, if the internal apparatus was not well adapted to the digestion of various substances. She has accordingly a membranous stomach, and a gastric juice, capable of dissolving animal substances; a crop too, and gizzard calculated for moistening, bruising, and digesting a vegetable aliment.

Nor are these relations confined to the component parts of the bird; they extend to the elements in which they generally exist, and to the purposes for which they are designed.

We have seen how admirably the raised neck, and the round swelling breast of the duck and swan are adapted to a watery element; how well the feet serve for oars, and how the wings, half opened to the wind, and gently inflated, act as sails to impel the animated machine. But then, these birds, which exhibit fine models for the art of navigation are solely adapted to rivers of a smooth winding course, bordered with herbage, or to such inland lakes, as are seldom ruffled by contending winds. The gannet, on the contrary, being designed to inhabit stormy seas, and to ride on stormy winds, coming at stated seasons from the northern regions, and endowed with sufficient

vigour to traverse the vast Atlantic, is wonderfully fitted out, for a very dissimilar mode of life.

The skin does not adhere to the body. It is merely connected by small fibres, placed at the distance of one or two inches, and hence the bird inflates it, at her pleasure. The weight is thus diminished, and the flight accelerated. No contrivance could be more appropriate for a bird, that has frequently to contend with adverse winds. A similar configuration is obvious in the booby and pelican. In the latter it answers a double purpose. It enables this apparently heavy bird not only to fly to a considerable distance, but it also facilitates her carrying without inconvenience, either fish or water, in her enormous pouch. A more extraordinary contrivance is hardly to be imagined, or one more admirable in all respects. The whole body is enveloped in a delicate membrane, wrinkled together, and communicating with the lungs; and from this, innumerable little ducts ramify in all directions. The ducts may be easily observed by the bubbles of air that fill them; insomuch that on pressing the body of a living bird, a noise is heard similar to that produced by pressing any inflated thing; while the air is displaced in every direction beneath the fingers. Nor are the ducts arranged without design. They are most numerous between the wings and ribs, and beneath the breast. We can, therefore, readily understand, that the pelican by drawing in at every breath a large supply of atmospheric air, may inflate herself to an unusual size; we know how greatly this inflation must promote the flight of so large a bird.

The bill, too, of the pelican, with its appendages, is one of those singularities, which occur whenever a peculiar purpose is to be answered. The upper part of the bill is flattened and hooked at the end. The lower, consists of

two flexible branches, which are admirably adapted to extend a vast membranous pouch, appended to them in the fashion of a bow-net. But is not such an appendage extremely inconvenient? No. The pelican by means of a set of filaments attached to the under edges, and fixed to the neck, wrinkles up the pouch into the hollow of the under mandible, when she has no immediate use for it. When, on the contrary, she begins to fish, she unfurls her bag to an incredible extent, and having replenished it, she returns to consume her prey at leisure.

This amazing pouch is covered, with a short downy and satin-like substance. It may be considered as analagous to the crop of other birds; only with this difference, that as theirs is situated at the termination of the gullet, this is placed at the top; that as pigeons and other birds macerate their food in order to feed their young, the pelican supplies hers, by a more ready contrivance.

Herein we may remark an extraordinary provision. This pouch is not a stomach where digestion begins, for it has not the digestive heat of that which appertains to other birds. The fish are, consequently, preserved fresh and entire; and in this the mother conveys them to her young. When about to supply their wants, she presses the pouch against her breast, and from this action arose the fiction of the ancients, that she nourished her young with her own blood.

This singular appendage accords exactly with the general habits of the pelican, and the kind of life which she is designed to lead. The labours of the morning abundantly supply herself and her callow brood during the whole day; and this facility in procuring food, as she frequently inhabits parched tracts at a distance from the sea, is essential to her comfort. It also answers another purpose, the

mention of which will lead to one of the most extraordinary facts in natural history. Pelicans abound in the scorched and desolate parts of Zaara, or Biledulgerid, where the lion holds an undisputed sway. Rivers are unknown there, fountains of water occur at remote distances, and a burning sun imparts to the arid soil an almost intolerable heat. But then, in order to cool their young ones, and to accustom them early to an element with which they must in after-life become conversant, pelicans bring from afar, in their enormous pouches, which are capable of holding forty-four English pints, water sufficient to fill their nests. Lions, and wild asses, often resort thither to quench their thirst, yet they never injure the unfledged birds, as if conscious that their destruction would stop the grateful supply.

Hence the Arabians call the pelican a water-carrier; the Egyptians a river-camel; and hence Musselmen piously observe that the Most High ordains these birds to inhabit parched deserts, in order to provide a fountain at stated places for those thirsty pilgrims who journey across their arid wastes, as in ancient times he sent his ravens to feed Elias in the wilderness.

In speaking of the component parts of different wild fowl, as referring either to themselves, or their localities, or the purposes to which they are assigned, we are further struck with the external organization of such as frequently continue for some time beneath the water. A portion of air is retained in the dilated wind-pipe, and between this and the lungs a bony and cartilaginous vessel is discovered, which answers the purpose of an air magazine while the bird is employed in diving.

Without this admirable provision, the species of aquatic fowl, for which it is designed, would be extremely help-

less ; but with it they glide freely through the waters ; in them they find their food, their shelter, their asylum. When the bird of prey hovers above them, or a fowler appears upon the shore, they plunge below the surface.

We have already noticed that in such as swim, the feet are constructed like broad oars for impelling the little animated ship, that the bird is at once the vessel, the rudder, and the pilot. This mode of structure is very obvious in the duck ; but then, while the Creator has peculiarly adapted her to a watery element, he also designs her to walk on land, and hence she is seen occasionally in the farmer's yard. The grebe, on the contrary, is destined solely to inhabit the ocean. Her legs are, therefore, placed so far back, as to look like oars, and are, consequently unable to support her weight, unless she stands erect. In this position, the striking of her wings, instead of raising her into the air, would most probably throw her down ; since her legs cannot aid the impulse. A great effort is, therefore, necessary, in order to enable her to fly on land ; hence, it happens that, as if conscious of her imbecility in this respect, she carefully avoids the shore, and in order to escape being driven thither, uniformly swims against the wind. The ocean is her home ; there she is as vigorous amidst the billows, as feeble upon land ; she swims, she dives, she dashes through the waves, and runs along the surface with astonishing celerity : mariners even assert, that being provided with a reservoir of air, she moves with additional celerity when under water.

Little dissimilarity is obvious in the feathers of land birds ; they are generally light, and elegantly arranged ; but in those of water-fowl a striking difference prevails. The shag, which prefers the extremities of the habitable globe, where nature seems as if benumbed with cold to

rest in eternal silence, is clothed with a thick plumage that defends her from its effects. Such is also the case with the grissard, which is destined to brave the most inclement weather. The grebe is protected round the neck with a silvery white muff, that unites the soft closeness of down, the elasticity of feathers, and the lustre of the finest silk. To which I may add, that the plumage of the breast is close and firm, and regularly disposed, and that its glittering filaments, lying one upon the other, form a shining surface equally impenetrable by cold and moisture. This vestment, so well adapted to the rigours of the climate, is absolutely necessary to the existence of the grebe, which generally remains on its native element, even during the severity of a Siberian winter. A very different kind of plumage distinguishes the blue petrel. The plumage of this bird is not only thick and abundant, but two feathers, instead of one, spring from the same root. Thus impervious to rain, she is seen with her companions traversing the vast seas between America and New Zealand, and often at the distance of seven hundred leagues from land.

Now, observe, how beautifully the Manchot family is preserved from the cold. Their bodies are cased in thick and shining plumules, which are laid as near each other as the scales of a fish. This cuirass is essential to their existence, for they live continually on the water, and are confined to the temperate and frigid zones; they are strange-looking creatures, and seem in character with the wild scenes to which they generally resort. A casual observer might think that they were without feathers; for not only do their short pinions appear as if covered with scales, but the whole body is wrapped in down, and above this light and warm covering innumerable little

bristles form a coat of mail that resembles shagreen, and is impenetrable by water.

Yet, on a close investigation, we discover in these plumules the perfect structure of a feather with a shaft and web; though widely different from those in which water-fowl are generally clothed, for they are light and airy, gracefully arranged, and yielding to the hand.

Speak we now of aquatic natures, and in these the same admirable construction, the same wonderful adaptation of means to produce a desired end, is equally obvious as in the feathered tribes.

“And God said, Let the waters bring forth abundantly the moving creature that hath life.”

The continual residence and progression of fishes in so dense a medium, as that of water, necessarily requires a remarkable peculiarity in the organs, by which they are enabled to glide rapidly, as well as a peculiar mode of exposing the vital fluid to the influence of the air. We observe, accordingly, that they are furnished with a curious apparatus for minutely dividing the water, and extracting the air with which it is intermixed. This apparatus consists of numerous laminæ, elegantly arranged in two rows upon the convex sides of the firm arches that support the gills, and closely resemble the teeth of a fine hair comb, or rather the diverging plumes of a feather. Each of these fine teeth is furnished with a cartilaginous plate, by means of which it is enabled to preserve its form and position against the pressure of the water. Such an apparatus is essential to the well-being of the ocean tribes, as the quantity of air consumed in their respiration is considerable, and in order to render it more effectual, the gills have eighteen sides, each of these has nearly fifty divisions or folds, the length one-eighth of an inch, the breadth one-

sixteenth, consequently a great number of subdivisions belong to the whole apparatus; the surface in a large fish being at least fifteen square feet.

Nor less admirably adapted are the organs of smelling, of hearing, and of sight, in the watery tribes, to their native element. Ancient naturalists conjectured that the sense of smelling did not belong to them; or existed, if at all, in a slender degree; but modern researches lead us to conclude that it is peculiarly acute. In several species, this organ is situated on the under surface of the snout; in others, in a shallow, oval, or round cavity, formed by the cartilage of the face. In the species which include the genus *raia*, a class of animals wintering in the mud and sand; and in the sharks, a solitary, vagrant, and voracious race, shining in the night, and resorting to the open seas, the aperture is covered in a great measure by a lid, which is capable of being either raised, or closed, by means of a number of fine muscular fibres. Hence, as the lid is shut, or opened, the water flows in and out of the cavity with more or less force, and brings any kind of scent upon the surface of the organ. This arrangement is obviously provided for the class of beings to which it is assigned. We discover nothing analogous in quadrupeds or birds, and yet the whole admits, occasionally, of considerable variations, as in the bony and most other fishes. In these the cavity is crossed and divided by a narrow flexible bar, in some instances resembling a cord, in others broad, and formed into irregular edges, thus producing two compartments, one of which continues open and preserves the same figure, while the other varies continually in size as the cord is drawn out, or recedes into the cavity. But how think you is the enlargement of the cord effected? By means of a bundle of muscular fibres. When, on the

contrary, it continues in a quiescent state; the elasticity of the parts, and the impulses of the water, are sufficient to depress and force it within the cavity, at which time the outer aperture becomes in some species so much contracted as to present the appearance of a chink; in others the bar is elevated like a tube. This peculiarity is very obvious in the carp; while, in the frog-fish, the organ of smelling is sometimes erected on the top of the snout in such a manner as to resemble two drinking glasses, moveable in very direction.

A beautiful arrangement of ligaments and nerves is attached to this wonderful apparatus. The magnitude of the latter, as well as the extent of surface upon which they are spread, are probably greater in fishes than in any of the quadrupeds, and, consequently, there is every reason to conclude that their sense of smelling is very exquisite. The sense of taste, on the contrary, appears to be imperfect, if it exists at all in the watery nations. Indeed it is hardly necessary to their well-being, as they generally select their food by the assistance of the senses of seeing, and of smelling.

The ear, that courier which never tires—that sentry always on his post—is contrived with the same admirable precision.

“The channel’d ear, with many a winding maze,
So artfully perplexed, to catch the sound,
And from her repercussive caves augment.”

An obvious difference subsists between the construction of this organ in terrene and aquatic natures: in the former, its external and internal conformation is such as to evince that it is adapted to the reception of sounds conveyed through the air; while, in the latter, a greater

simplicity of construction points out its adaptation to an aqueous medium. But what in the human subject is the construction of that organ which Cicero terms the messenger and interpreter of things? For such an enquiry is necessary, in order to enable us to understand the immediate subject of our investigation. It is that of an external ear, calculated like a trumpet to catch and to collect the pulses of the air; of a tube which leads into the head, lying at the base of this outward ear; of a thin membrane, called the *membrana tympani*, like the pelt of a drum, stretched across the tube upon a bony rim; of a chain of moveable and infinitely curious bones, forming a communication, and the only communication that can be observed between the membrane last mentioned, and the interior channels, and recesses of the skull. The organ consists also, of cavities similar in shape and form to wind-instruments of music; of the eustachian tube, like the hole of a drum, to let the air pass freely into, and out of, the barrel of the ear, as the covering membrane vibrates, or as the temperature becomes altered. The whole may be considered as hewn out of a rock, that is, wrought into the substance of the hardest bone in the whole frame. Such is the assemblage of connected parts which altogether constitute an apparatus, which is plainly enough designed for the admission of sound.

Now mark the difference which subsists between the construction of this organ in terrestrial, and aquatic natures. As sound is conveyed to fishes through the medium of water, they do not require an external ear; nor any projecting part for collecting sound. This organ is, therefore, properly speaking, internal, or within the head. It is placed on the back of the neck; the surrounding skin is smooth, and generally a little depressed, but if at all

elevated it is thick and unyielding. Two oval membranes are also perceptible, one on either side; they adhere firmly to the edges of two small openings, from each of which a funnel-shaped duct leads directly inward, and being connected with the membrane that covers them, is supposed to have some effect in regulating the impression of sound.

The parts, which immediately constitute this important organ, are apparently the same in all. They consist of three membraneous and semi-circular canals, thin, transparent, and elastic; with a dilated opening, either cone-shaped or triangular, or else resembling a broad flat disc, but each containing certain calcareous substances, upon which the nerves of hearing are principally spread. Every part is filled up with a soft transparent pulp, resembling plaster of Paris, when prepared for casting; but these calcareous substances are not allowed to float at liberty; they generally adhere to the inclosing substance, and are further kept in their places, by a variety of nerves. Considerable dissimilarity is obvious in their construction, yet they are uniformly concave on one side, and convex on the other; the internal surface being smooth, and the external rough.

These hard calcareous substances are placed in the transparent pulp for the evident purpose of increasing sound. Campiere ingeniously observes, that in order to understand the excellence of this arrangement, and of the manner in which a hard floating body is affected by the slightest external motion, it is only needful to put a marble, or any firm substance into a glass of jelly, when its movements will become sensible to the hand in shaking the jelly, or in giving the glass a slight rap.

He who forbears to notice the minor wonders of creation, may consider this investigation as little deserving regard;

but let it not be forgotten that on this wonderful apparatus depends the comfort and well-being of innumerable creatures, to whose annual visitations, mankind are almost entirely indebted for support, in some sterile regions of the globe.

Antient naturalists disputed the possibility of hearing under water; but whoever will take the trouble to observe the construction of fishes, and the element in which they move, must be convinced that a peculiar sensibility of sound is essential to their safety. In fact, sound is conveyed with greater or less facility, according to the elasticity of the medium through which it passes, and, consequently, it will be more readily propagated through water, than through air. The former will even convey sound much further. If two stones are struck smartly together beneath water, the stroke may be heard at a greater distance by an ear placed below the surface than above it. Dr. Franklin, who made the experiment, notices that sound was conveyed to him at the distance of more than a mile, and even further; that it did not seem faint, as when the distant chiming of a cathedral, or the rolling of remote torrents, came, at intervals, upon the ear; but clear and distinct, as if just at hand. Such an obvious distinction, of course, required a peculiar modification in the organ for receiving sound; and hence we find that in the ocean tribes, the extent, and the elasticity of the different parts, the existence of calcareous bodies, and of various nerves, point out the suitableness of this organ for receiving sounds through a medium of considerable denseness. So just is the observation of the poet!—

“ God, in the nature of each being founds
Its proper bliss, and sets its proper bounds.
He cares for all; to birds he gives the woods,
To beasts the pastures, and to fish the floods.”

These lines occurred to my remembrance, when meeting a fisherman coming down the Pass of Llynberris, at the time I was ascending it, a fine trout, which he had taken from a neighbouring lake, attracted my attention. There are moments when the most trifling objects make a powerful impression on the mind. Perhaps the grandeur of the scenery, by which I was surrounded, led me to notice, with peculiar interest, the wonderful construction of this feeble creature. It seemed to be something that I could understand, amid a world of grandeur and sublimity. The surrounding scenery was, indeed, magnificent. Not a sound broke the silence of the place, except the hollow whistling of the wind, or the distant murmur of a waterfall. Not a moving object met the eye, unless, occasionally, a few black cattle slowly descending the narrow passes between the rocks; or a solitary mountaineer carrying peat. Large masses of huge stones continually impeded the way, and covered the ground, as if the fabled conflict of the giants had here received its tremendous termination. From one of the highest elevations, or rather from the rugged side of a precipitous descent, the pedestrian looks down upon a sublime avenue of rocky mountains, at least four miles in extent, on the left of which glitters the beautiful lake Llynberris, with Dolbadam's ruined tower reflected on its surface. An extensive sheet of water appears in the remotest distance, and beyond this, a range of blue hills stretches across the utmost boundary of the alpine view. They seem to shut out the world, and to enclose a scene, which for grandeur and sublimity is most probably without an equal.

The eye, which Sturmius held to be a cure for atheism, is not less remarkable in fishes than in animals. A necessity exists that the rays of light, in passing through

an aqueous medium into the eye, should be refracted by a more convex surface, than when they enter immediately from the air. We observe, accordingly, that in the ocean tribes the crystalline lens is much rounder, than in those of land animals, and that the organ seems adjusted to near objects.

The eyelid is a necessary appendage in most cases. It defends the eye, clears it every moment from such floating particles as may attach themselves; and like the drapery of a pavilion, closes round, and protects it during sleep. But such a provision is unnecessary to creatures that inhabit the water. It is, therefore, generally omitted, and instead of this beautiful and singular contrivance, the Creator has provided them with a vertical and immoveable veil, that projects a little over the eye: and which is very obvious in the salmon and mackerel. In the moon-fish a more remarkable compensation has been discovered; this is, a lid, which is drawn over the organ of sight at the will of the creature, containing a circular perforation, the aperture of which is shut by one muscle, and opened by five that rise from the bottom of the orbit, and proceed into the eyelid. In like manner the eel, which has to work its way through sand or gravel, is provided with a transparent, horny, convex, case or covering, placed before the eye, at a short distance from it, in such a manner as completely to defend the organ without injuring the sight. The eyes of the bimaculated, or two-spotted sucker, which are prominent, and capable of rapid motion, independent of each other, revolve in a fixed transparent sphere, for the evident purpose of protecting them, when driven by the waves against the stones. Those of its relative, the Montague sucker, a frequent inhabitant of the rocky shores of England, are small and placed high, with

two minute erect tubes, or filaments, immediately before them. Those on the contrary of the opah-doree, a brilliant fish exhibiting the colours of scarlet, and burnished gold, are remarkably large. They are also covered with a loose membrane of the same gorgeous hue, and capable of being readily inflated. A similar peculiarity is observable in the bib cod-fish.

As the natives of the ocean do not require any aqueous secretion for keeping the surface of the eye moist, the lachrymal gland is wholly omitted. A fact, well deserving the attention of those who overlook the superintending goodness of the Creator in this portion of his works.

I may further speak of the singular construction of the teeth in fishes; that the points are turned downward like the teeth of a wool or cotton card and are extremely curious in their relative position: that a considerable degree of beauty is sometimes obvious in their arrangement; and that in such as prey on shell-fish, the grinders are flat and strong like those of certain quadrupeds, for the evident purpose of breaking the stony coverings, in which they are enveloped. That further, the waved-scarrus is provided with short cutting-teeth, for the dividing of seaweeds; while in the trout and salmon, a variety of hook-shaped teeth enable them to catch water-insects, and small fishes.

It is also interesting, briefly, to observe that the cavity of the mouth in fishes is usually very large in proportion to their size; that the mechanism of the jaws, the smallness, and immobility of the tongue, the want of salivary glands and the usual form and position of the teeth, unite to point out the manner in which these creatures are designed to take their food.

Hence the necessity that exists for the number and

formidable appearance of their teeth, which not only assist them in grasping their prey, but also hinder it from escaping; for that part which in aërial and terrestrial natures is frequently invested with considerable beauty, and gives to the human form no small degree of its grace and dignity, is denied by the Creator to this department of his works. The reason may be readily explained : a neck, though essential to the loco-motion of other animals, is unnecessary to fishes, as they possess the faculty of moving their bodies upwards, and downwards, and uniformly seek their food in an horizontal position.

The air-bag is an admirable provision, by which the largest fishes are enabled to sink, or rise, at pleasure in the water. This bag adjusts the specific gravity of the fish, and causes it to pass almost without an effort, through that element, which is nearly nine hundred times heavier than the air, and offers more resistance. Fins too are given for the express purpose of enabling it to move rapidly, and the tail is equally adapted to promote the purposes of loco-motion.

Thus wonderfully constructed for their native element ; the finny tribes were launched forth in the great waters, with a prospective view to the benefits they would ultimately confer on man, when he should require every aid for the support of his precarious existence.

All then were happy, and all were perfect ; but changes, which it is not now our design to notice, gradually took place, till at length, after the great catastrophe of the deluge, the continents and islands became such as they now are. From few, that is, from eight persons who survived the wreck of every thing besides, sprung the present race of men, who have spread abroad over this great globe ; the European and the Asiatic, the Indian and the African,

some in temperate and happy regions, others beneath the glowing Line; others again in the northern and southern extremities of the globe. For all of these has the Most High abundantly provided. To one class of men he has given fruitful seasons to fill their heart with food, and gladness; to another such productions of the vegetable world, as supply their wants with the least possible labour; to one portion of the globe large herds of cattle, to another wild fowl and migratory fishes; to another, sagacity in obtaining from every part of the known world, such things as are essential to their comfort. Thus has he cared even for those who often receive his bounty without a single thought of the mercy that bestows it.

We now proceed to consider how remarkably aquatic natures are adapted to different regions of the earth. The salmon genus is equally diffused in rivers or solitary lakes, embosomed among rugged mountains, where the inhabitants depend upon them for their support. Witness the lakes and rivers of Asia and of Europe, and the migrations of their finny natives to the sea. Rapid and stony rivers are their favourite resorts, down which they often journey at least one hundred leagues to the salt water, and at certain seasons return again to their upland homes. The same shoals uniformly find their way into the rivers, out of which they came, whatever changes may have taken place upon their shores, and however much they may have been swelled by recent rains, a fact well known to those, who live beside the salmon fisheries, who are consequently not uneasy when a general migration takes place, as they well know that the vagrants will return again.

When journeying to the sea, these creatures swim as near the surface as possible; when on the contrary, they reascend the river, they uniformly keep low down. The

reason of this may be readily explained : in going up they are opposed by the current, which always runs more swiftly at the surface than beneath ; but in descending, they float upon the stream, and are borne gently onward by its motion.

Such are the general characteristics of the salmon genus. The species vary only in a few particulars, and, perhaps, one of the most curious as respects common salmon, is the way in which they form the beds of their future offspring. The male and female act in concert, and when they have selected a proper place, they dig a pit at least eighteen inches deep, where the spawn is deposited, and which is carefully covered over with soft sand, or river weed. They then return to the sea, and the spawn lies buried from December till the spring. At this time the young salmon begin to emerge in great numbers, and, guided by the unerring instinct which their Maker has assigned them, they remain contentedly in the place of their birth, till the coming down of the floods, by the aid of which they are swept into the sea. Here also they continue till the appointed time of their return, and this, in general, agrees exactly with the departure of aquatic birds to those sterile regions, where the inhabitants depend on the supplies of sea and air for their support. They then set forth in their migrations, and ascend the most rapid rivers, undeterred by either rocks or torrents, or even considerable falls, over which they have been seen to spring with surprising alacrity, even to the height of several feet.

Thus admirably all things harmonize. Witness the construction of the fish, which is beautifully adapted to its mode of life ; the storms of winter, and that state of the atmosphere which causes the snow to melt, and occasions

those rapid floods which bear the young fry onward to the sea ; that calmness of the stream at a considerable depth which enables them to reascend the rivers ; that ceaseless flowing of the water which again facilitates their downward progress, and that wonderful agility as well as strength, by which they are assisted, when returning homeward, in surmounting even serious obstacles ; above all, the energy which induces them to force their way against the most rapid waters, and to journey on for several hundred miles to their desired haven. It would seem most natural that the creatures should continue in salt-water, but then the great purpose of their existence could not be effected, namely, that of providing for the necessities of man. Let him who wishes to ascertain the benefits which their migrations annually confer on some of the most inhospitable regions of the globe, consider the local disadvantages of Greenland.

Clear, cold, and briskly running streams are the favourite haunts of the common trout. The alpine carr inhabits, in like manner, the lakes of high and mountainous countries throughout Europe, but its principal resorts are those of the Lapland Alps, where it feeds on the larvæ of innumerable gnats which continually infest them. The Laplanders, who are obliged to migrate during summer to the distant lakes, find in these fish an ample supply of food, when all other means of support begin to fail. We might further notice the wanderings of various others of the salmon genus, and how admirably their migrations are adapted to the privations and necessities of man ; but such discussions would lead too far, and we shall therefore briefly mention that the Greenland salmon, swarm on the shores of Greenland, of Iceland, and New-

foundland, and that they form in each the chief support of the inhabitants during a considerable portion of the year. In Iceland they serve, when dried, as winter food for the cattle. Yet this invaluable species, though well adapted for performing long voyages, is never observed in the warm regions of the globe, and so wonderfully is the instinct of migration impressed on these useful creatures, that though they remain contentedly at sea during the greater portion of the year, no sooner has Gemini appeared on the horizon, than off they glide, as if by mutual consent, and fill the rivers throughout their prescribed limits, during the three succeeding months of May, June, and July.

The common mackerel too, that beautiful fish with its silvery scales and transverse black lines, generally appears at stated seasons, within the Arctic circle, where it assembles with its companions in innumerable troops, and diffuses plenty wherever it appears. Thus they pass a considerable portion of the year; but when the winter sets in, they hide themselves in the soft mud, which extends beneath the vast crusts of ice that surround the Polar coasts. Here they are protected from the effects of frost, till the footsteps of spring are seen impressed on the shores of every bay and river, and the larch hangs forth her golden blossoms, as if to warn them away. They then arise, and proceed on their perilous migrations in enormous shoals that frequently extend for miles in length and breadth. Their route has been described as similar to that of the herring, for they pass between Iceland and Norway, and proceed towards the northern part of Britain. Here they divide, and while one column throws itself into the Baltic, another passes downward and enters the Mediterranean through the Straits of Gibraltar.

Who has not heard of the migrations of the pilchards

and the herrings, and of the abundance which they annually confer upon our own coasts of Cornwall? The importance of the former to the inhabitants of Europe, and those more especially of the northern countries, is very great. Pilchards, too, usually appear in vast shoals on the same coasts about the middle of July, and disappear again in the beginning of winter. Some naturalists conjecture that they are borne by the currents of the northern ocean from the Arctic circle; others, that they inhabit the deepest parts of the sea, or plunge beneath the soft mud, whence they ascend at the spring season, and approach our shores. Certain it is, that their arrival on every coast is adjusted with an exact reference to the necessities of the inhabitants, and that in some portions of the globe, where the soil cannot be cultivated, their arrival, like that of the salmon genus, exactly tallies with the departure of different kinds of sea-fowl.

We have noticed the admirable adaptation of these creatures to the element they inhabit, and how wonderfully they are assigned to different parts of the world; it now remains that we present them to our readers in a different point of view. Their Creator has given them a more extended period of duration, and, perhaps, greater facilities for enjoyment than either land animals, or birds. Most of the disorders incident to mankind arise from the changes of the atmosphere, but fishes reside in an element little subject to variations. Theirs is a uniform existence; their movements, as Lord Bacon observes, are nearly without effort, and their lives without labour. Their bones, also, being united by cartilages, admit of great expansion, and the different sizes at which the same species frequently arrive, are singularly various. They still continue growing; their bodies, instead of suffering

the rigidity of age, which happens to land animals, increase by fresh supplies, and as the body grows, the conduits of life furnish their stores in greater abundance. Rzaczynki, a celebrated Polish naturalist, mentions a pike that was ninety years old. Gesner, also notices that in the year 1497, a fish of this description was taken near Hailbrun in Suabia, with a brazen ring affixed to it, on which the following words were inscribed in Greek characters:—“ I am the first that was put into this lake by the hands of the governor of the universe, Frederick the Second, on the fifth of October, twelve hundred and thirty.” The age was, consequently, two hundred and sixty-seven years. To land-animals, long life would certainly not be a blessing, from the weariness which old age frequently occasions, and the difficulty of procuring food when the limbs grow feeble. But with the finny tribes the case is widely different. Their continual sportiveness evinces their enjoyment of life; and their movements are the most agreeable that can readily be imagined. The ocean is their home, and they can either float upon its tranquil surface, or dive at will into its immeasurable depths. Beautiful groves of coral invite them to glide through their mazy windings; theirs are the submarine grottos, with all the elegant appendages of sea-weeds, and fuci; the green oozy valleys, clothed with marine shrubs, and the clear gushing rivers that bear their tributary waters to the ocean, with all those exquisite productions which the waves occasionally cast upon our shores.

Fishes, too, enjoy the pleasures of society: they journey together in large companies. The Almighty has given them a peculiar instinct for the benefit of his creature man, but then, in order to effect the purpose he designs, he has further given them both memory and judgment, a

disposition to assemble in vast numbers, as if for mutual support, and a decided predilection for one part of the world, in preference to another. Thus much we know, because the results are obvious to every one who visits the coast of Cornwall during the herring and pilchard fishery. In order to produce this end, we observe a peculiar mechanism in the construction of the eye and ear, in the organs of motion, and in the general contour, for the body of a fish is beautifully adapted to its watery element. Then there is a mind which directs the movements of all these. Pardon me, my reader, if I speak of mind as connected with a fish; and think not, because you are accustomed to associate this faculty with those who stand erect, and walk on solid earth, that the inferior orders of creation are without it. The element in which the finny nations live, forbids much intercourse, and we are accustomed to consider them solely as articles of food. But they have much in common with ourselves. It is even said that they are susceptible of affection, and M. Jesse tells us that a person who kept two small fishes together in a glass, having given one away, the other refused to eat, and showed evident symptoms of uneasiness until his companion was restored to him. The kindly feelings of our nature may equally exist beneath a scaly covering, as in the higher orders of mammalia; and it would be well for those who boast of their pre-eminence in the scale of creation, to consider how many modifications of the intellectual qualities actually subsist. One observation more, and we shall then dismiss this portion of our subject.

It seems to me that the Creator has called the ocean-tribes into being for the evident purpose of multiplying happiness, and to show forth his glory and his wisdom. "For his pleasure they are, and were created." An im-

portant truth which the volume of inspiration teaches. Let us, therefore, thankfully acknowledge his goodness in this portion of his works.

“And God created great whales, and every living creature that moveth, which the waters brought forth abundantly.”

These, too, were created happy, and in them the same wonderful construction is obvious, as in the smaller tribes of ocean. But when the waters brought forth abundantly, the earth had not experienced that momentous change, which renders them invaluable in those desolate regions, which we have no reason to believe were then, either desolate or unfruitful. It is, however, to those regions that they are now especially assigned, and we must therefore speak of them in connexion with this part of our subject.

One of the most forlorn portions of the globe is between the seventieth and eightieth degrees of north latitude. Towards the pole appears a vast region of thick ice, where not a single moving object meets the weary eye; in the north-east is seen a cold and woodless country, where there are rocks clothed at the base with moss, and capped with eternal snow. Further from the Pole appears an ocean hoary with mountains of floating ice, which look in the horizon like towers and citadels in ruins. Farther still is Spitzbergen, the queen of desolation, rising in the midst of the Arctic Sea. Observe the general appearance of the country. It is that of several primeval rocks, without either earth or water, except cataracts of melted snow, which fall into the sea, in columns of dazzling brightness; of black and rugged mountains streaked with snow, that form a boundary on either side, and rise, crag above crag, far as the eye can reach.

In another part, are columns of ice floating in all direc-

tions; sometimes fifteen hundred feet in height, and extending, at least, nine miles. Observe the vivid corrugations that play around them, and make known their coming long before they appear on the horizon. Some look like Gothic churches, adorned with pinnacles, and fretted roofs, arched windows, rich tracery, and all the gorgeous accompaniments of that highly ornamented style. Others are seen gliding from the farthest north.

“ With forms so various that no power of art,
The pencil or the pen may trace the scene!
Here grotto, within grotto, safe defies
The sunbeams; there embossed and fretted wild,
The growing wonder takes a thousand shapes,
In such a palace, poetry might place
The armoury of winter; where his troops
The gloomy clouds, find weapons, arrowy sleet,
Skin-piercing volley, blossom-bruising hail,
And snow, that often blinds the traveller’s course,
And wraps him in an unexpected tomb.”

COWPER.

Look at the fields of ice. The larger are sometimes two-hundred yards in extent, moving slowly and majestically along, or else resisting the whole power of the ocean, and producing near the horizon, that bright appearance which mariners call the “blink of the ice.” The less, if such a term may be applied to pieces several acres in size, are the meadows of the seals, on which large numbers of these creatures may be often seen. These pieces are borne rapidly by the currents, till yielding to the pressure of the larger, they are lifted from the water with a noise that takes away the sense of hearing, or else with a grinding of unspeakable horror.

If we look towards the confines of the Polar regions, and survey the shores of Greenland, the extreme verge of

Lapland, Nova Zembla, the Riphæan ridge, and the Altaic chain of mountains, similar scenes of desolation are every where discoverable ; cold, and woodless shores, mountains, capped with eternal snow, and glaciers of ice, that never melt. Yonder is Iceland. The landscape has all the grandeur that the eye seeks for in a volcanic country ; wild hills, fragments of old lava, richly broken shores, and, in the centre, the most terrific of volcanoes, Hecla, throwing up its incessant volumes of smoke into the air.

If we are asked why the land is destitute of vegetation ; why the sea is hoary with mountains of floating ice ; why the sun at one period encircles the heavens—at another, entirely withdraws his beams ; we answer, that such is the will of God. He is pleased to bestow the largest share of blessings on that portion of the globe which lies between the thirty-fifth and sixtieth degrees of north latitude ; and let us thankfully acknowledge his goodness in permitting us to share so many blessings. Yet, even in the apparently deserted regions, of which we are now speaking, where the howling of the wind, the raging of the waves, and the collision of large masses of ice, produce a variety of fearful sights and sounds ; we discover striking instances of that universal system of compensation, which, to a certain extent, supplies the defects of one part, by some counteracting advantage on the other. Notice, for example, the creatures that frequent the Northern ocean. How different in their instincts and construction from such as generally abound throughout the warmer regions of the globe ! Enormous whales are seen riding upon the billows, and throwing up their jets to an amazing height. Their relatives, the pike-headed whales, either reposing on the surface, or unfolding their plates or furrows, to decrease their specific gravity, and appearing as if elegantly

striped with red: cachelots pursuing large companies of dolphins, and driving them on shore; groupes of these graceful creatures springing from the waves of the Arctic sea, surrounded by their young, and winning their easy way amid the terrors and the wonders of the deep. Seals too are there, and sea-unicorns in immense numbers.

These different species are admirably adapted to their ocean sites, and are evidently designed to supply the wants of those who reside along the coasts. Oil is necessary for their lamps; skin-dresses are essential to protect them from the wet, and warm fur-clothing from the cold: the bones of large fishes are often used instead of timber, in the erection of summer-dwellings, and their skins are also employed in making the little boats, in which they often brave a raging sea. All these are supplied by the various species, that frequent their shores, and of which we have now to speak.

The common narwhale, or sea unicorn, (*Monodon Monoceros*), is an animal of colossal strength. He dwells among the Polar icebergs, towards the eightieth degree of north latitude, in the empire of perpetual frost, where darkness reigns during a considerable portion of the year. This giant of the waves is invaluable to the inhabitants of the Arctic regions. The oil it yields, is superior to that of the common whale; its flesh supplies the Greenlanders with wholesome food; the tendons are made into strong and durable cords, and the long horns are either manufactured into hunting darts, or used as rafters for roofing houses, on those inhospitable and woodless shores. But how, it may be asked, can such terrific and strong animals be overcome? Not entirely by the strength of man, but by means of a singular peculiarity in their construction. They frequently assemble in such numbers

in the open creeks of the icebergs, that the manner in which they press upon each other, obliges the hindmost to rest their horns upon the backs of such as precede them. While thus entangled, the intrepid mariners rush upon their prey, and destroy considerable numbers.

The general length of this colossal species is from forty to sixty feet, and from each side of the upper jaw projects a sharp-pointed horn or tooth, from seventeen to twenty feet in length, about the thickness of a man's arm, and beautifully white. This horn is of considerable importance to the animal, who occasionally uses it as a weapon of defence, but more generally to loosen from the rocks, and to plough up from the bed of ocean, the marine plants on which it feeds. The narwhale is, therefore, often seen covered with fuci, or wreathed with long pendant branches of beautiful sea-weed.

In former times few articles of foreign importation were thought more valuable than this graceful species of marine ivory. A horn, in the possession of one of the Chancellors of Denmark, was sold by his heirs for eight thousand imperials. Nor will this appear extraordinary, when we consider that it was often used for the most costly purposes. A splendid throne of the same material is still preserved in the castle of Rosenberg; it stands in the largest apartment of this once princely mansion, where assembled nobles did homage to their monarch.

We now pass on to animals of the genus *Physeter*; and equally valuable are these to the natives of those sterile regions, the shores of which they generally frequent. Their flesh affords an abundance of wholesome and nutritious diet; the teeth and bones are manufactured into darts. Their oil replenishes the lamp, and strong cords are fabricated from the tendons. Navigators pursue these animals with eagerness; for their oil is preferable



ROCKS OF SPITSBERGEN WITH ICEBERGS.

to that of the common whale, and their teeth are harder; they are, consequently, susceptible of a finer polish than even the elephant's. Some of the species, also, yield both ambergris and spermaceti.

As the natives of the frigid zone obtain many additions to their comforts, by bartering the long horns of the narwhale for articles of foreign growth, so are both ambergris and spermaceti important objects in the Greenland trade.

It is delightful to associate these huge creatures with those stern and imposing scenes, where even the rude sailors who have not been familiarized with the Arctic regions, often express the astonishment which their characteristic features are adapted to inspire. So true it is, that the most untutored minds are susceptible of powerful impressions from the vast and terrible in nature. And independent of the feelings that are simultaneously excited by a succession of living mountains, crowned with water spouts, and gambling in the deep, with the ease and rapidity of the smallest vessels, it is cheering to witness the appearance of animated beings in a world of solitude and desolation. One spot, (if spot it might be called, on the fluctuating deep,) is vividly presented to our minds, by the description of a friend. Immediately in front of him appeared the austere and savage rocks of Spitzbergen, on which the sun, from time to time, shed an ungenial light athwart the clouds. The sea, gently agitated, shone with a faint and peculiar sparkling. Not a murmur broke upon the ear, except the rustling sound, which the movements of these huge animals occasionally produced, and the monotonous cry of a crowd of sea-gulls, steering towards the south.

Imagination wanders with delight over scenes of grandeur and uncertainty. A solitary vessel, ploughing the

waves of an unknown sea, surrounded by creatures of strange aspect and enormous bulk, seemed liable, every moment, to become their prey. Such might have been the case, had their rapacity equalled their size : but no creature is less voracious than the common whale, (*balæna mysticetus*.) They feed, as some naturalists allege, upon different kinds of marine insects ; according to others, on the medusæ, or sea blubber, though some occasionally prey on small fish. The reason of this peculiarity is obvious. If the voracity of the *balæna* family accorded with their bulk and number, the watery tribes would be unable to procure an adequate supply of food ; although the Northern seas are plentifully replenished with marine insects. Nor is the peculiar gentleness of the huge animal less deserving of attention. He is remarkably pacific, and leads an easy inoffensive life, on the billows of the Arctic sea, where his aquatic brethren safely repose under the shelter of his enormous bulk. Nor will it be irrelevant to pursue a little farther, the natural history of this inoffensive creature, in connection with the benefits, which his visits confer on the northern regions of the globe.

The whale is termed the monarch of the ocean ; but this distinction apparently results, rather from his extraordinary dimensions, than from any inclination to ensure, or to retain it ; for the love of sway is by no means synonymous with strength. The elephant and the camel fly before the tiger and the lion : the eagle exercises a decided superiority over the ostrich. We may pursue the analogy still farther ; both the whale and the elephant are the largest and the strongest in their respective dominions ; yet they are seldom known to offer an injury to others ; both are terrible when provoked to resentment, though rarely inclined to avenge themselves. The lordly ele-

phant is often driven from his haunts by insolent invaders: the whale, if he sways the sceptre of the deep, sways it by a very precarious tenure; it is often wrested from him by the most despicable of his subjects: creatures so diminutive and subtle, that his amazing strength is insufficient to rid him of them.

We have already noticed that Spitzbergen is the favourite resort of the lordly whale. Our readers are aware that the country is cold and woodless, and that the surrounding ocean is dangerous to navigators. Notwithstanding this, Europeans have resorted thither for more than three centuries, and thinned the number of its cetaceous occupants. These hostilities are carried on for the sake of the oil and whalebone. The former is extracted from various parts of the body, the latter adheres to either side of the upper jaw, and is formed of their parallel laminæ. A considerable number of these laminæ are surrounded with long stiff hairs, and a double purpose is answered by them. They effectually prevent the shorter laminæ from injuring the tongue, and serve as bars to prevent the escape of the molluscæ, on which the animal generally feeds, when in the act of throwing up his jets.

There is much danger, and something of sublimity, connected with the whale-fishery. Riding on the billows of the Arctic sea, the creature journeys fearlessly along, now showering his jets to an amazing height, now lashing the billows into foam, till no longer seen on the remotest waves, or vanishing behind the jutting crags, which, like enormous buttresses, are posted round the iron shores of Greenland and Spitzbergen. But in vain does he shower his jets into the air, or fearlessly ride the billows of the main, or disappear behind the craggy rocks that bound his ancient empire. The whale fishers hear the sound of his

coming. "Row away, my lads, row away," resounds from the distant boats. The rowers, with the silence and composure of machinery, lengthen their strokes, and bend themselves to the oars with all the energy of their well-strung muscles. Short and almost certain is the conflict, for it rarely happens that the poor whale can escape from the fury of his persecutors.

When the pursuit of these stupendous creatures first commenced, and the mariners and merchants of England and Scotland penetrated into the Arctic seas, they were so tame as to float at ease in the gulfs and bays of Spitzbergen, unsuspecting of harm, even when strange ships approached, and the harpoons of the fishermen were lifted up to strike them. They were consequently destroyed without an effort to escape, and it is recorded that hundreds were sometimes captured in less than a week. But in the course of a short time the survivors learned to fear the face of man; and the dreadful destruction of their kind, forced them to resort for safety into remote bays, whence they were soon chased into the open sea, and far away from land. But the trackless ocean afforded them no shelter from their enemies; they were still pursued, and with such avidity, that authentic history narrates the destruction of fifty thousand, by Dutch whalers, in the course of a few years. Retiring before their ruthless pursuers, they next took refuge along the line of perpetual ice; till at length, worn out by incessant persecution, they plunged into the regions of the farthest north, amid icebergs and avalanches, and all the terrible accompaniments of the Arctic zone, where the boldest whalers have not, till lately, dared to follow them. In consequence, the fishery, which was formerly carried on in the sea between Greenland and Spitzbergen, was nearly abandoned,

and it would have been so entirely, if Captain Ross had not penetrated through the mass of ice, which renders the entrance to Baffin's Bay most hazardous, and opened to the whalers that vast extent of ocean which afforded a last asylum to the persecuted whales. This fishery employs a capital of nearly a million sterling. It is one of the best nurseries for fishermen, and gives employment to Hull, Peterhead, and Frazersburgh, with several other towns in the kingdom. The most northern parts of Baffin's Bay, together with Lancaster Sound, and Regent's Inlet, are now fishing stations of great importance; for these once unnavigated seas have been so accurately described by recent intrepid mariners, that a route is fairly opened to less adventurous traders. They are taught that the seas abounds with whales; while the icy barriers, which have never been passed since the days of Baffin, with the coasts and harbours, are so accurately described, as to render a voyage into those far distant regions comparatively safe. The immediate and practical utility of the recent Arctic voyages is, therefore, evident, as without them the great whale-fishery, which employs so many hands, would in all probability have been lost to the country, not to mention the extension of geographical knowledge, and the improvement of science.

Let us now recur to the natural history of the whale. The attachment of this interesting species to their offspring is almost proverbial, and forms one of their most beautiful characteristics. They are seen calmly riding the most furious surges with their young, of about seven or eight feet in length, clinging to their tails or fins. But here, it may be asked, how are these inexperienced creatures able to preserve their balance? By means of the side-fins with which they clasp their parents, and thus avoid the

danger of falling off. Yet it sometimes happens that the young whale lets go its hold, and tumbles headlong from its slippery elevation. When this occurs, the dam turns immediately, and, darting under the water, takes it up again. Maternal instinct is beautifully described as one of the most powerful, lovely, and energetic of all the instinctive feelings which the Deity has given to the rational part of his creation, as well as to inferior natures. While engaged with her young one, the careful mother is never known to aim a stroke with her tail, however indignant at the insults of her pursuers. She depends for safety upon the rapidity of her movements, and eludes the vigilance of the fishermen by plunging beneath the water. If the harpoon chance to strike the young whale, the parent, notwithstanding the utmost danger to herself, will never desert it while life continues, and any chance of preserving it remains. She will even turn on her remorseless persecutors, and has sometimes forced them to quit the chase. The utmost care is, therefore, taken to secure or to disable the parent, before attacking the object of her solicitude.

Inattention to this circumstance, most probably, occasioned the loss of the ship *Essex*.

This vessel sailed from Nantucket in North America, during the fall of the year 1819, on a whaling voyage to the South Seas. Having reached the place of destination, and observing several whales in sight, the crew joyfully lowered their boats with the expectation of being soon able to complete the cargo; the master, George Pollard, and Chappell, the second mate, each succeeded in striking a *balæna*, and were actively engaged in securing their victims, when a black servant, who was in the mate's boat, suddenly exclaimed, "Massa! where's the ship?"

The mate looked round, and saw the Essex lying on her beam-ends, with a large whale riding along-side. On observing this, he immediately cut his line, and made to the ship; the captain did the same. When arrived there, they heard, to their great astonishment, that she had been struck by a whale of the largest size, which rose close to the vessel, then darted under her, and knocked off a considerable part of the false keel. They had scarcely recovered from their astonishment, when the whale re-appeared, and after swimming about a quarter of a mile, it returned with great velocity, and gave the ship a second stroke. She then filled with water and fell over her beam-ends. The crew exerted themselves to the utmost; they cut the masts away, and set the vessel to rights; vain were all their efforts, she was a mere wreck, the quantity of oil on board alone prevented her from going down. The whale, meanwhile, kept in sight for several hours, as if to ascertain the extent of the injury, but without attempting any further molestation.

It would be foreign to our subject to follow the unfortunate sailors in their perilous attempt to reach the Friendly Islands, where they hoped to find a temporary home, as the American Continent was seventeen hundred miles from the place where the accident occurred. A few only survived to relate the history of their sufferings, and preservation.

Such is the whale-fishery; such, too, are the dangers that are frequently connected with this adventurous trade. Its various productions are conveyed through the whole of polished Europe, and diffused among countries possessed of wealth sufficient to purchase them; but in the Polar regions, and along the cheerless shores, which constitute their immediate dependencies, the numerous family of

Physeter are hailed by the forlorn aborigines as a gift from heaven. There the blessings which they confer are incalculably great.

“ For these

Desire no more than simple nature gives ;
They love their mountains and enjoy their storms.
No false desires, no pride-created wants
Disturb the peaceful current of their time ;
The watery tribes their riches. These their tents,
Their robes, their food, and all their homely wealth.”

THOMPSON.

We find, accordingly, that the genus *Physeter* is given in exact accordance with the necessities of the inhabitants throughout the whole extent of the vast seas that wash the shores of the *Tschutschi*, Newfoundland, Hudson Bay, and the gulf of Canada, which is almost covered over with islands, and receives into its bosom the vast rivers, which, after forming the deafening cataract of Niagara, thunder down the slopes of numberless foaming cascades into a matchless navigation of several hundred miles.

Old Greenland, especially, acknowledges her obligations to this valuable species, which seem reciprocally to delight in wandering near her inhospitable shores, and to enliven the dark waters of the northern ocean with their resplendent brightness.

The natural history of these colossal animals is well deserving the attention of the philosopher. They doubtless gave rise to the fabulous stories of hyperborean monsters, extending, like an immense bank of sand, or a reef of rock, on the surface of the water. But such exaggerations are unnecessary to excite our wonder. The animals in question, impress every beholder with astonishment and awe. Their dimensions are terrific ; they have been seen at certain epochs and in certain seas, three hundred feet in

length, and weighing more than three hundred thousand pounds; at a considerable distance from the Arctic pole, even from seventy to one hundred feet, though some of the specimens are considerably smaller.

The forms of these gigantic creatures are considerably varied. Some exhibit the shape of an immense and irregular cylinder; in others the body resembles two cones, united at the base, but the most general is that of an ellipsis, more or less perfect. The aperture of the mouth is terrific. Duhamel Dumonceau relates, that two men entered, without stooping, the mouth of one that was taken in the Somme during the year 1726. It has been said that even fourteen men have stood upright in the interior.

The statement appears incredible; but before rejecting it as fabulous, let us consider the astonishing dimensions of this huge animal. One specimen has been known to weigh nearly three hundred thousand pounds; its mass was equal to an hundred rhinoceroses, or two hundred hippopotami, or an hundred elephants. What then must be the shock of such a tremendous battery, when coming with the rapidity of lightning?

Hence, it often happens, that, as in the instance of the ship *Essex*, an enraged whale will aim his terrific blows with so much effect against the vessel which contains his persecutors, as to cleave it down the middle, or to break an oar in two, and this so completely, as scarcely to produce a single splinter in the wood. To which we may add, as a striking instance of the surprising strength of this enormous creature, that some years since a fin-whale came into a harbour near Cape Cod and towed away a sloop of about forty-six tons burden. The spectators from the shore conjectured that the whale, in rubbing against the anchor, became entangled with one of the prongs, and

that finding herself wounded, she tore away with the utmost expedition, and carried the vessel after her; for it was seen to fly across the waves as if scudding before a heavy gale of wind. When the whale came into deep water, she plunged downwards, and would have carried the vessel with her, had not the cable given way. On seeing this, some of the spectators ventured from the land, and towed the ship back into the harbour. Their conjecture, with regard to this extraordinary circumstance, proved correct. The whale was thrown on shore with the anchor adhering to her body.

The ribs of this gigantic species are used by the Tschutschi in the construction of their winter dwellings. These are vaulted and partially sunk below the ground. The frame-work is composed of drift-wood and the ribs of whales; the roofs of more slender materials, on which long tufts of grass and layers of earth are placed alternately; the whole is surmounted with a kind of sentry-box, made of the bones of large fish. The frames of the summer-huts are constructed in a similar manner with long poles and ribs. The latter, also, form the stages for drying fish.

This style of building is very ancient. The commander of the fleet of Alexander observed, that the Gidrosi, a people living on the shores of the gulf of Sind, made the frames of their doors, and rafters, of the bones of whales. The histories of the ancients are often confirmed by the discoveries of the moderns. Nor is this the only use to which the bones of aquatic animals are appropriated. The Tschutschi bury their dead under heaps of stones, on the top of which they affix the rib of a whale instead of a lar. Their materials are simple and uncouth, but equally expressive, with the sculptured monuments of polished nations.

The whale, like the ocean he inhabits, has never been subjected to the sovereignty of man : the period necessary for his complete development cannot, therefore, be accurately determined. Centuries have elapsed since this colossal animal was first pursued by European navigators ; but subsequent specimens have never equalled in size the early inhabitants of the Polar seas. Some naturalists have conjectured that his longevity is in proportion to his dimensions, and that the larger species may have lived, at least, one thousand years. We need not, therefore, be surprised that allegorical writers adopted the giant of the main, as an emblem of duration.

The whale can inhabit any part of the ocean, though he seldom wanders from the bleak retreats of the Polar seas. His tribe has been long diminishing in number ; and there is reason to believe that the period is not remote, when this gigantic remembrancer of former times, shall exist only in the memories and the histories of man ; when its colossal remains shall attract the admiration of another age, as those of the mastodontes and megatheria do of ours. Change, diminution, decay, and death, are perpetually going on, and nature is permanent only as a whole.

Six species appertain to this extraordinary genus :—the common whale, to whose peculiar characteristics the preceding observations more particularly refer ; the fin-fish, and pike-headed, the bunched, round-lipped, and beaked whale. The fin-fish is distinguished from his brethren by a solitary fin, which renders him conspicuous at a distance. He is found occasionally in the British seas ; but uniformly in those vast tracks of northern ocean where the great whale-fishery is carried on. His capture is rarely attempted by our fishermen, as the whalebone is short and knotty, and the oil inadequate to counterbalance

the risk of encountering such a fierce and agile creature. Yet, worthless as he may appear to European navigators; he offers to the Greenlanders a plentiful supply of food, and is generally most abundant when the other species begin to fail, or rather his appearance in the northern regions produces a scarcity of the other kinds.

Such are the few particulars that have reached us, respecting these colossal animals; and while speaking of the benefits which they confer on the northern regions of the globe, it seemed desirable to mention something of their instincts and construction. It is also well to notice how wonderfully their Creator has impressed on them an inclination to frequent those shores where alone their services are wanted. Consign the species to the Mediterranean seas, or to the shores of the Madeiras and Canaries; to the coasts of Spain, or amidst the glowing regions of the line; the land of olives, and of citrons; of beauty, and of fragrance, and their visitations would be worse than useless. Their bones are neither required in building, nor their oil for lamps; neither are their tendons wanted for ropes and cordages; nor their intestines to answer the purpose of window-glass. All these are obtained from vegetable productions, except in the latter instance. Remove the whale from the shores of Greenland, from Spitzbergen, and the wild uncultivated regions of the Arctic Circle, and where could substitutes be found for all the various articles which he abundantly supplies? Oil would be wanted for the lamp that enlightens the subterraneous abodes of the natives, during six long months of darkness; ropes would be wanted for various purposes; bones to supply the place of rafters in erecting summer dwellings; and transparent skins for the admission of light; besides

various commodities that are bartered for articles of foreign production.

In mentioning the general characteristics of the whale we have had occasion to observe that peculiar gentleness, which renders him one of the most inoffensive of the watery inmates. Were it otherwise, the great size and strength of this huge creature would often cause a famine in the seas which he frequents.

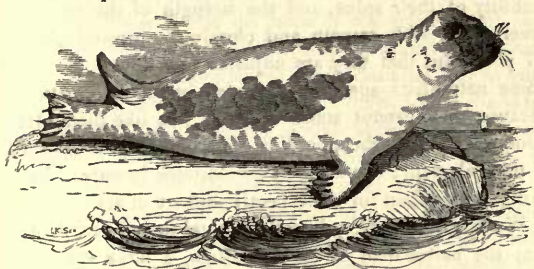
We cannot dismiss this portion of our subject, without again referring to the wonderful construction of cetaceous animals, which have little in common with their finny neighbours, except that they inhabit the same element, and are endowed with the same powers of progressive motion. Dr. Shaw well denominates them fish-formed mammalia. Like quadrupeds, they have a heart furnished with two auricles and two ventricles, and their blood is warm and red; they breathe also by their lungs, and not by means of gills, as in true fishes. Thus far internally they agree with land animals; but there is one peculiarity, which decidedly distinguishes them, and that is the air-bladder. This admirable appendage is situated about the middle of the body, and is either expanded or compressed, according to the inclination of the animal. By its aid the bulky creature is enabled to float at ease upon the water; to spring sportively from off its surface, and to gambol with inconceivable rapidity among the sparkling icebergs of the northern sea. The suspension and loco-motion, the swift descent, and rapid rising of so huge a creature in the liquid element is principally owing to this wonderful contrivance, as otherwise, his enormous weight would cause him to sink like lead in the great waters; but with it every difficulty is removed.

In fishes, the tail is the great instrument of motion ; and is so constructed as to answer this important purpose. If the creature wishes to seize its prey, or to escape pursuit, or to move rapidly, a double stroke with the tail, first one way, and then another, enables it to dart forward. If, on the contrary, it desires to turn either way, a single blow with the tail, in an opposite direction, sends it round, and thus, by varying the motions of the tail, according to the purpose which it desires to effect, the creature either moves swiftly forward, or upward, or downward, with great readiness and agility; and yet, without feet or hands, or a firm substance on which to support itself. But in warm-blooded, or cetaceous fish, which are obliged to rise every few minutes to the surface of the water, in order to take breath, the tail, unlike that of their finny neighbours, is horizontal; its strokes are, therefore, perpendicular to the horizon: and these either send the creature upward or carry it rapidly into the deep. It is, in short, the main spring of those movements which astonish every beholder. It acts too, as a most vigorous lever; and it is with this, as with an enormous weapon, that he repels his enemies, and occasionally destroys them.

The whale has also an organ of vision, admirably adapted to the watery element, and to the humid atmosphere, through which he is designed to see objects. He can prevent any inconvenient quantity of light, by interposing between it and the eye a veil, which may be rendered more or less opaque, according to the depth at which he chooses to station himself below the surface of the water. He can further use this organ as he pleases, and when he raises his huge head to look around, the veil is thrown aside, so as to extend his view over an im-

mense plain, formed by the surface of the tranquil sea ; and the only limits to his powers of discernment are the smallness of the objects, or the curvature of the earth.

The whale can also hear sounds at a great distance. When he swims along the surface of the ocean, his ear is often eight or nine feet below the level of the sea ; it is therefore through a watery medium that the sonorous vibrations arrive at the acoustic organ. The aqueous fluid is indeed a most excellent conductor of sound, for by means of its currents, it transmits even the slightest noise to a very great distance ; and most wonderfully is the ear adapted to receive it.



The Greenland or Harp Seal. (*Phoca Groenlandica*.)

We know but little of these inmates of the rock and flood. Naturalists may explore the margins of their favourite haunts, and seek out the wonders of nature in her sequestered scenes, but there are boundaries over which they cannot pass ; for who may ascertain the habits of these half amphibious creatures, while seeking their subsistence on the oozy bed of ocean, or amid those isolated and sterile rocks, round which the billows form a barrier to the investigations of scientific men.

The structure of the seal is so peculiar, that it seems to

have suggested to the imagination of the poets the idea of syrens, tritons, and sea-gods, which they invested with a human head, the body of a quadruped, and the tail of a fish. The feet of the seal are indeed so short, and so much enveloped in the skin, that they are not adapted for moving quickly on the earth, but then, as the intervals between the toes are filled with a membrane, they make excellent oars. These animals, accordingly, pass a considerable portion of their lives in the sea, and never land except to bask in the sun, or to nurse their little ones. It is wonderful to observe how well they are adapted to the element by which they are surrounded; their elongated bodies, the great mobility of their spine, and the strength of the muscles, covered too with smooth and closely compressed hair,—all point out that they are adjusted to a watery element. Some naturalists speak of them as imperfect creatures, because they cannot stand erect, or run like themselves upon a smooth surface, but this is unfair; we cannot exist in their element; nor are they comfortable in ours. Each being is organized for its respective sphere of action.

We may also notice, in reference to their construction, that the neitsersoah or *phoca cristata*, a large species of seal, which inhabits the Arctic seas, and is very common on the coast of Greenland, is provided with a thick black wool beneath his white hair, which gives him a beautiful grey colour. This comfortable under garment preserves the phoca from being injured by exposure to the cold, when forced to quit his warmer element, to land upon the frozen surface of a rock. He has also a strong folded skin upon the forehead, which he can draw at pleasure over the eyes and nose like a cap, and thus he is effectually defended against the stones and sand which are driven against him, by the wind in stormy weather.

This species is so remarkably buoyant, as to float when dead for a considerable length of time, a curious fact, the knowledge of which we owe to the intelligent and indefatigable Crantz. It happened, one July morning in 1827, that two of the United Brethren, who had settled on the coast of Greenland, launched forth in quest of seals. One of these was well skilled in the management of the small skin-boat, which is used on those occasions; the other was an inexperienced navigator. The most skilful soon killed a huge neitsersoah, about nine feet in length; while his companion, in combating with another, glided upon a piece of ice, and was in considerable danger. Nathaniel, for such was the name of the most skilful, immediately hastened to his relief, and succeeded in securing their victim; but, suddenly, while thinking only of success, a strong north-wind arose, and carried both the skin-boats to sea. No situation could apparently be more hopeless than the one in which these poor men were placed; they were driving about upon a piece of ice in the open sea, their little boats had drifted off, and around them was a raging ocean. They shouted for help, but in vain—not a single boat was to be seen. Meanwhile the wind increased, and urged both the skin-boats and the piece of ice swiftly along upon the waves. But the former soon disappeared, and with them all hope of safety. “In this affliction I prayed fervently to my Saviour,” said the narrator, “and thought with great grief of my poor family, yet still a small degree of hope sprung up in my breast.” While thus hurried along by the raging ocean, the piece of ice suddenly came in contact with the dead seal, and as suddenly the thought arose within him to spring upon its back, and to endeavour to go in quest of the skin-boats, with the assistance of the paddle which he had happily re-

tained. The wind was high, and the waves furious, and they continually washed over him; yet the body of the seal being sufficiently buoyant to bear up his weight, he kept his seat, made after the boats, and at length succeeded in overtaking one of them, into which he crept. He then paddled in search of the other; this he likewise found, and still keeping possession of the seal, he hastened joyfully to his almost despairing companion, whom he at length reached with great difficulty. The poor man then seated himself in his little skin-boat, and both returned home in safety with the captured seals.

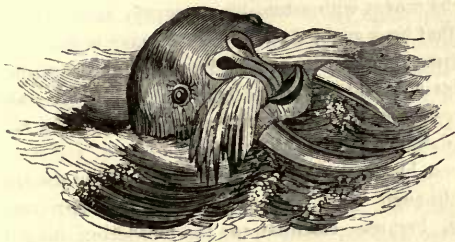
While relating this extraordinary escape, Nathaniel ascribed his preservation, not to his own contrivance, but to the mercy of God alone; and he added, "When I found myself delivered from death, and sat again in my little boat, I shed abundance of grateful tears to our Saviour; for, in my greatest distress, my only hope was placed in Him."*

Seals are generally diffused throughout the northern and temperate regions of the globe. Some few species are migratory, and though apparently subservient to fixed laws, their visits to different parts are uniformly adjusted with an obvious reference to the privations of the inhabitants. Some are highly esteemed for their skins, which are used as thongs; others for their oil; others, again, are wrapped in short and glossy hair, which forms an important article of commerce.

There are also others of this strange family calculated to excite the curiosity of the naturalist, and among these we recognize the sea-bear, the sea-lion, and the morse. The first of these evinces considerable intellect and much pa-

* Diary of the Missiöparies at Friedereiksthal in Greenland.

rental feeling and affection; concerning the second we briefly learn that his loud angry voice is often heard to mingle with the roaring of the waves; and that, in order to prevent surprise, each herd places a sentinel within call, who makes a signal in case of danger; of the third,



The Morse.—(*Trichechus Rosmarus*.)

that he is found with his companions in large troops throughout the northern Atlantic ocean, and in the Polar regions of the vast Pacific. Like their relatives, the seals, they equally affect both land and water, and mount the icebergs in order to bring up their young; they subsist also on the same food, and live together in numerous societies. But they do not travel so far as the seals, and seem more attached to their native haunts.

Those vast tusks, which are seen to rise above the surf, are very valuable; indeed, more so than ivory. The oil, too, is in much request, and hence, the harmless morse is frequently attacked when he ventures incautiously on land.

We may also notice the porpus and the grampus, as important in the stern regions which they inhabit.

The first, affords a striking instance of the partiality of public opinion. While his graceful relative, the dolphin, the theme of poets and historians, has been placed among the stars; this animal, though possessing the same qualities, habits, and affections, has received from mariners and fishermen, the degrading appellation of sea-hog. Yet the porpus moves with astonishing celerity, and it is well for him that he is enabled to do so; for many of the European maritime nations pursue him into remote regions in order to obtain his fat, which is convertible into oil; and the natives of the furthest north consider his flesh as no ordinary dainty.

These huge creatures are also found within the tropics; for although most numerous in the northern tracts of ocean, because essential to the bordering inhabitants, several species congregate within the temperate and torrid zones, and especially on the shores of the Caraccas.

Concerning the two varieties of the *delphinus*, the orc, and grampus, few particulars of interest have reached us. The first is an animal of considerable power, though the tyranny which he exercises in the waters has been much exaggerated by the genius of fiction. When assembled in troops, the party becomes so bold and voracious, so predatory and fearless, that although individuals never prey except upon such fishes as cannot offer a resistance, when thus mustered, they will even venture to attack the larger whales.

The second, which inhabits the stormy seas of Scandinavia, the Arctic region, and occasionally the Mediterranean, is equally voracious with his relative. Yet poets and historians have celebrated the extraordinary attachment of this species to their young, of which the following instance affords a beautiful illustration.

A grampus, accompanied by her cub, having swum into a shallow part of the sea, was deserted by the tide and enclosed on every side. The men on shore perceiving their defenceless condition, ran down upon them with such weapons as they could collect. The poor grampus, and her cub, were soon wounded in several places, and the water was stained with their blood. They made frequent efforts to escape; the mother, by dint of superior strength and agility, at length forced herself over the sand-hills into deep water; but though in safety herself, she could not bear to leave her young one in the hands of the assassins. She, therefore, again rushed in, and seemed resolved, since she could not prevent, at least to share its fate. The pursuers pressed still closer; the strength of the grampus would have soon failed, but happily the tide had been for some time rising, till at length it rolled above the sand-hills, and pouring in among the shallows, kept the assailants at a distance, and carried off the grampus and her cub in triumph.

Thus is the grampus frequently entrapped, and as frequently escapes. No animal illustrates more pleasingly the strong parental tie that binds them to their offspring, than these unwieldy creatures.

Few instances are recorded in which any of the species have been tamed. One, indeed, is mentioned by the younger Pliny, which is a well known fact. We may briefly notice another exception in the case of the lamarin, or menaties, a gentle creature, which frequents the shores of the Atlantic. One of these was kept by a Prince of Hispaniola, in a lake adjoining his residence, about the period of the Spanish invasion. It was called Matum, or the gentle one, and would answer to its name; but it hated the Spaniards in consequence of an injury it had

received from one of these adventurers. (The tale of Arion was here realized.) It would offer itself to the Indians, and sometimes carried ten at a time across the lake, while they sung and played on its back. One youth was especially its favourite, and so marked was its attachment, that it reminded me, says the narrator, of the classical parallel of the dolphin at Hippo. But the fates of the two watery occupants were very different. Matum escaped to its native waters by means of a violent flood; the Hipponian fish was sacrificed to the poverty of the retired colonists.

We have spoken of these creatures as wonderfully constructed, and as supplying the wants of man in some inhospitable regions of the globe: let us now refer to the degree of happiness and to the kindly feelings with which their Maker has endued them.

It is true, that the whale has many enemies, but his sources of enjoyment are neither few nor precarious. He gambols on the heaving billows of the ocean, and visits the bottom of the watery world, wherever his inclinations lead him. The bason of the sea is his; the unfathomable depths of water, and the stupendous caverns of the great abyss, are a home to him. Armadas may contend above his head, and furious hurricanes may agitate the surface of the deep, but he dives beneath them, unmolested by the tumults and concussions that rage above. He can also ascend at pleasure from out the briny main, and float sleeping upon the billows, or sport with his little ones in the bright warm sunbeams, while the icebergs are hurrying by. A naval officer relates, that he often amused himself at New Brunswick, with observing the gambols of the whales, who congregated there in considerable numbers and seemed very frolicksome and playful. He saw these

immense creatures spring entirely out of the water, into which they again descended, with a noise like thunder.*

Captain Hall, further relates, that having seen a whale entangled amid coral reefs, spring to the height of twenty feet, from which he fell back into the water with a deafening splash, he inquired of Captain Scoresby, if he had ever witnessed such a curious sight in the Arctic regions, to which the Captain replied, that he had often been much amused with observing similar exploits among the whales in their mighty freaks. Such gambols were more common among the young, than with those of maturer years; though even among these, some full grown fish, at least fifty-feet in length, were seen as merrily employed. Captain Scoresby also mentioned, that he had seen them leap so high as to be completely in the air, and that he had often gone in pursuit of these frolicksome creatures.†

Seals too, how happy they are! That future, which so often harasses the mind of man, has no terror for them. Mariners report, that some species delight in thunderstorms, and that they are often seen to sit on rocks, and contemplate, with seeming delight, the convulsions of the elements. They also possess a sufficient degree of intelligence, which undoubtedly adds much to their enjoyment. It is beautiful to witness the bottle-nosed seals, when swimming forth, in a calm evening, a little way to sea, the female carrying the young upon her back, and the male occasionally pushing them off, in order that they may try their swimming powers. Quarrels rarely occur among them; and though they sleep by thousands on the shore, each family keeps apart, and each of the old

* United Service Journal, 1831.

† Hall's Frag. Voy. vol. i. p. 135.

patriarchs has his own sleeping stone, to which he uniformly resorts. They collect in considerable numbers on the floating ice, and bask in the hot sun, while borne swiftly onward by the waves.

But if we speak of happiness as connected with the natives of the deep, where shall we find a more beautiful exemplification of it, than in the dolphins, that sport so gaily through the sparkling waters?

No language can adequately describe the exquisite beauty and variety of the enchanting scenes, among which the dolphin is often found. A friend relates, that when arrived within sight of the island, which is fabled to have received Arion, after his escape from the treacherous mariners, the magnificent dome of heaven appeared to rest on a vast expanse of water, studded with small islands. Clouds of gorgeous hue, flitted rapidly across it. The sun, which, during the day, had rejoiced, as a strong man, to run his race, then descended towards the chambers of the west, and reflected a parting radiance on the waves, as they rolled by. Leaning over the gunwale, our friend admired, in silence, the grandeur of the scene; it seemed as if a glory, which the earth owns not, was diffused around, beneath, and above; and that another sun, and another firmament appeared at an equal depth below. A crowd of dolphins attended the progress of the vessel. At one moment darting upwards to seize the barnacles that adhered to her side; at another, gambolling on the waves, and assuming that incurvated form, which painters and sculptors generally assign them, and in which they are seen on the coins of Alexander, preserved by Belon. Further down, as if in the mid-region of the heavens, summer-birds appeared to dart in all directions; further still, large masses of rolling clouds reflected the brightness

of the setting sun, varying every moment, as they moved majestically along—now rich with all the hues of heaven,—now what was luminous becoming gradually paler, and disappearing in the vault of night. Then Hesperus was seen to twinkle beneath the waves, and one star to light up after the other, till it seemed as if innumerable fires blazed in the water, and that the waters had laid aside their quenching nature; and all these appeared at a depth so vast, and so terrific, that the mind was ready to forget the succour that reason offered.

A thousand indefinable emotions rush upon the classic voyager as he sails along the shores, or visits the islands of the Mediterranean; not a creek, nor promontory, wood, nor mountain exists, which has not its own appropriate legend and tradition. But the design of the narrator, in visiting these celebrated scenes, was not so much to view their exquisite beauty and variety, nor the interesting memorials which they every where exhibit, as to notice and record, what the Roman orator has well denominated the insatiable variety of nature. “Away with the subtilties of philosophy,” said this great and enlightened heathen, when contemplating the wonders of the earth, from the shores of the same ocean: “here we have ocular demonstration of the beauty of those things which we attribute to divine goodness.”

The dolphins, which gave rise to these remarks, are a gentle inoffensive race, and remarkable for their intelligence. They were the favorites of ancient poets, who gave them the appellation of the sacred fish. They were supposed to delight in approaching the haunts of men: and hence the Mediterranean, scattered over with islands, the Tiber, and the shores of Greece, were their favourite resorts. But we need not recur to the fictions of the poets,

for these gentle creatures are better known than any of the species, and may be easily taught to recognize the hand that feeds them.

The maternal dolphin nurses her young with the tenderest care, and carries them under her pectoral fins, which answers the purpose of arms. While her little one is yet feeble, she exercises it in swimming, sports with, and intrepidly defends it, should any danger approach; and never quits the object of her solicitude till it can do without her care.

Not only is the female dolphin united by the bonds of a tender and lasting affection to her young, but the male, also, attaches himself for life to his companion, and becomes her most zealous guardian and protector. It is even said that the sentiments of mutual affection in these animals extends to all the individuals of the species. They are seen assembled in numerous troops, in regular phalanxes, formed, apparently, in order of battle, and commanded and directed by a chief, chosen from among those who have displayed the greatest vigour and intrepidity in combat. It is very pleasing to observe the crowds that often accompany the course of rapid vessels, and are seen sporting amid the waves. Their brilliant colours, their graceful forms, their bounding leaps from off the billows, and the sparkling of the water, as it flows down their glossy skins, render them objects of peculiar interest. Very cheering too it is to think how much happiness is shed abroad among them; how vividly they enjoy the fresh sea-breezes, and the bright warm sunbeams, and how readily they can escape to their retreats in the deep blue sea.

He who sails in windy weather along the coasts of Greenland, or Labrador, in the Atlantic, or Pacific oceans;

in the gulfs of Panama, near the Gallipagos islands, or, in short, in almost any sea, may often observe the unwieldy porpus traversing the agitated surface in perfect tranquillity, and cutting, without difficulty, its foaming waves. To the muscular force and powerful instrument of swimming, with which the Creator has endued this formidable animal, the porpus owes the astonishing rapidity of his motion; as also those wonderful springs and evolutions which the eye can hardly follow.

Humboldt, when advancing towards the shoal that surrounds Cape Arenas, and stretches as far as the petroleum-springs of Maniquarez, noticed the porpus, in connection with one of those varied sights which the great phosphorescence of the sea often displays in the equinoxial regions.

The moon had not risen; but that part of the milky way which extends from the feet of Centaur, towards the constellation of Sagittarius, seemed to pour a silvery light over the surface of the ocean. The white rock, crowned by the Castle of St. Antonio, appeared, from time to time, behind the high tops of the cocoa-trees that border the shore, beneath which the twinkling lights of the Guagueria fishermen were occasionally visible. Bands of porpuses seemed to delight in following the ship. Fifteen or sixteen swam at equal distances; and when, in turning on their backs, they struck the surface of the water with their broad tails, they diffused a brilliant light that appeared like flames issuing from the depth of the ocean. Each party, in ploughing the surface of the water, left behind it a tract of light, the more striking, because the rest of the sea was not phosphorescent. As the motion of the oars, and the passage of the vessel, produced, on that night, but feeble sparks, it is natural to suppose that the vivid light,

occasioned by the porpuses, was owing, not only to the stroke of their tails, but also to the gelatinous matter that envelopes their bodies, and is detached by the motion of the water.

Magnificent ocean ! what countless myriads are concealed within thy bosom ! What strange creatures pass along the paths of thy waters ! If the whole earth is filled with the glory of Jehovah, so is the great and wide sea, wherein are things creeping, innumerable ; fishes, both small and great. There go the whales, bearing their vessels full of oil, to cheer the long dark night of the Polar regions ; there bands of porpuses diffuse a brilliant light, and gladden the barren shores of Lapland and its tributary isles with the prospect of approaching plenty. There the common narwhale, the cachelot trumpo, their tribes and families, supply the want of timber, on woodless and inhospitable shores. All these are diffused in exact accordance with the wants of the inhabitants throughout the whole extent of those vast seas that wash the shores of the Tschutschi, Newfoundland, Hudson Bay, and the gulf of Canada. There also bound the dolphins, playful and graceful creatures ! the grampus, emblem of maternal love, and the innocent and sociable menati. Others, as the “ daughters of the sea,” with their timid relatives, the Stelleres, rarely lift their heads above the waters ; others again, seen at the interval of ages, remain concealed in the deepest recesses of the ocean.

For His glory they are, and were created ; at whose rebuke the waters went down into the place which he had founded for them.

We cannot speak much concerning these. We cannot tell how beautifully, or how fearfully they fill up their appointed stations, for our paths are not upon their fields.

But let us bear in mind, that though we can discern but little of the Creator's greatness, or benevolence, in their construction, there are eyes to behold them which have never been dimmed by mortal tears; that when the voices of ten thousand times ten thousand and thousands of thousands were heard ascribing, "blessing and honour, glory and power to Him who sitteth upon the throne, and unto the Lamb for ever;" the same glad symphony was taken up by every blessed and rejoicing creature that walked the earth or sea.*

"Nor think though men were none,
That Heaven would want spectators, God want praise.
Millions of spiritual creatures walk the earth
Unseen, both when we wake, and when we sleep;
All these with ceaseless praise his works behold
Both day and night."

MILTON.

* Revelations, v. 13.

SIXTH DAY OF CREATION.

And God said, Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind. And it was so.

And God made the beast of the earth after his kind; and cattle after their kind, and every thing that creepeth on the earth after his kind. And God saw that it was good.

And God said, Let us make man in our image, after our likeness; and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth.

So God created man in his own image; in the image of God created he him; male and female created he them.

And God blessed them; and God said unto them, Be fruitful and multiply, and replenish the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth.

And God said, Behold I have given you every herb bearing seed, which is upon the face of all the earth, and every tree, in the which is the fruit of a tree yielding seed; to you it shall be for meat. And to every beast of the earth, and to every fowl of the air, and to every thing that creepeth upon the earth wherein is life. I have given every green herb for meat. And it was so.

And God saw every thing that he had made, and behold it was very good.

And the evening and the morning were the sixth day.

GENESIS xi. 31.

THIS important day was marked by completing the creation of every kind of animal that was to dwell on the surface of the earth. Cheerful voices were heard among the bushes, and rejoicing creatures passed rapidly along the fields of air; the sea too was filled with brisk and animated natures, but the earth itself was not inhabited, the beautiful plains and valleys presented a vast unbroken solitude, on which the sun shone bright, and soft breezes swept across, but there were none either to enjoy, or to embellish.

But in one moment, the same commanding word, which gave existence to the watery creatures, and such as fly across the heavens, called forth a new creation, and every organized being, began immediately to fill up its allotted place. Innocent sheep were seen tranquilly grazing on the plains, and goats upon the heights, huge elephants, and stately horses, cows and bounding deer, antelopes, and camels, zebras, and lions, bears, and panthers, covered the surface of the earth, in all the beauty and the vigour of their new existence.

No place was lonely then, the valley and the forest, the widely extended plain, the hill, the glade, and mountain, had each its separate inhabitant, and when the mighty work of creation was completed, when every thing was set in order, and all knew their allotted places, man was formed in the image and the likeness of his Maker: an expression which most probably relates to the intellectual and superior nature with which the Most High was pleased to invest him. And to man was given dominion over the whole earth; thus clearly showing that all terrestrial creatures were designed to be subordinate to the end, for which God had placed within it that intellectual and immortal being. Yet still that being was taken from the

earth, closely linked to it by his animal nature, but united to his God, by that living soul which was thus mysteriously breathed into him. The mineral globe was, therefore, evidently formed and appointed for the residence of man, to sustain also the animal and vegetable kingdoms, which are eminently adapted, not only to supply the necessities of the human resident, but to exercise the many powers with which he is endowed. To him, therefore, the Most High was pleased to assign the dominion over his newly created world.

“ Now heaven in all her glory shone, and roll'd
Her motions, as the great first Mover's hand
First wheel'd their course; Earth in her rich attire
Consummate lovely, smil'd.”

MILTON.

Glorious, indeed, must have been the spectacle that was then presented. All knew their appointed places, and there was no evil among them. Even now it is wonderful to observe how admirably every creature is fitted to the station for which it is designed. And could we embrace, in one comprehensive glance, the whole creation, we should assuredly find that not a quadruped, nor bird, nor insect, vegetable, or stone, from the ostrich to the humming bird, from the lion to the ant, from the cedar to the chickweed, from the diamond to the rudest pebble, is placed without design, and in the very place from which it could not be removed without occasioning a break in the creation. And not only is every organised thing, placed in the position it is designed to fill, but it is so placed as to receive the air most needful for its good, the degree of light most suited to its purpose, and the kind of warmth which it requires, as well as in very many instances, to minister immediately to the necessities of man.

We shall shortly have occasion to notice some striking instances of utility among the animal creation ; but, first, let us briefly consider a few remarkable particulars in their construction.

Pliny lamented, that among the countless myriads which move on the surface of the earth, the human species were alone obliged to defend themselves with extraneous coverings. Other animals, said he, are provided with hair, or down, or feathers, shells, or prickles, scales, or fleeces ; nay, even trees are fenced with different kinds of bark against the injuries of cold or heat ; while man alone, the lord of all, is obliged to depend upon his own ingenuity for that clothing, which nature has so liberally provided for her other children.

But herein is a manifest demonstration of the wisdom of the Creator. And surely it is no small proof of his beneficence, that such as have neither reason to contrive, nor hands adapted to the making of clothes, should come into the world with coverings, exactly fitted to their several exigencies and places of abode. Whereas, that being whom he has made a little lower than the angels, and to whom he has imparted the magnificent gifts of life and light, intellect, and the power of appropriating them, having an understanding to contrive, and hands to execute his wishes, and sufficient materials afforded him from the skins and fleeces of animals, the fibres of vegetables, and the bark of trees, is very properly left without any natural covering, as he is so well able to assist himself. And, hence, the variety of manufactures, the number of hands that are employed, with the ingenious arts, and curious contrivances that minister to this important end.

But to proceed with our specific provisions for the animal creation : it is curious to observe how wonderfully

they are provided with different kinds of clothing. Some are covered with a short smooth pile, others with stiff bristles, others with fleeces, or thick and warm furs, which not only defend them from the cold and wet, but serve to cherish their tender young. Such, especially, as inhabit the northern regions of the globe, are wrapped in fur even to the very tip of their claws; while the elephant, which is assigned to the sultry climates of the south, is entirely without.

We could linger on the curious construction of the muscles, and tell how admirably they are affixed to every joint, in order to pull it different ways according to an especial purpose and design: on the beautiful arrangement of the bones and joints, and of the nerves which run throughout the body, of the organs of taste and smell, of hearing and of seeing, but this would lead too far: we shall, therefore, briefly notice a few remarkable particulars connected with the animal economy.

How much wisdom, power, and beneficence is discoverable in the various means by which different creatures are enabled to obtain their food! Those who feed on grass and herbs, are endowed with an accurate smell and taste to distinguish between the salutary and pernicious; those whose food is not so readily obtained, are gifted with superior sagacity, either to seek it beneath the ground, or to discover it at a surprising distance. With this view the noses of all burrowing animals are made remarkably strong, and are edged with rough borders for the express purpose of turning up the earth; their nostrils, too, are so placed, and their smell so accurate, as to find out whatever they pursue by digging. This arrangement is very obvious in the mole and swine. Rapacious animals, on the contrary, such as wolves and foxes, wild dogs, hyenas,

and all their numerous relatives, discover their prey afar off, either by the sight or smell. How curiously are such animals as climb adapted to their relative positions, not only by the structure of their legs and feet, but by the strength of their tendons and muscles. This is very obvious in the opossum, which has continually to ascend trees, and to hang some times suspended by his tail. The tail, therefore, is provided on the under surface with spines or hooks at the articulation of each point; and when the tail is twisted or wound round a branch, the weight of the body is principally sustained by the hooks, and consequently little muscular exertion is required, except to bend the tail.

How admirable is the principle implanted in all creatures to provide for their feeble offspring! How carefully do they seek out places of security; and nurse, and rear them with the greatest tenderness, lull them with their soft parental voices, and cherish and keep them warm; how wisely do they teach them to pick and eat, and to gather food for themselves! In short, they act the part of careful nurses, deputed by the Sovereign Lord and Preserver of the universe, to help the tender and feeble ones that are committed to their charge; and because they are unable, with a few exceptions, to carry these young creatures, or to clothe or dandle them, they are covered with warm vestments from their birth, and are soon able to walk about and to provide for their own support, that they may be no longer burdensome to their kind parents than is absolutely necessary.

Very remarkable, too, is the preservation of such animals, as are unable to procure their food during the severity of winter. When the season of flowers is over, and all the fruits are gathered in, when the sun-beams are scarcely

felt, and the nights grow chill and frosty, what becomes of such animals as suffer from the cold? Where shall food be found for those who subsist on summer fruits? To obviate this evil, and to preserve innumerable species from perishing, our Merciful Creator has given to such as suffer especially from the cold, that peculiar organization, which enables them to sleep through the winter in secure retreats, till the warm sun awakes them, and ripens the fruits or grain upon which they live. Such is the case with the hedgehog and the dormouse, the bear and marmot; while innumerable others carefully lay up their treasures in the earth, or in hollow trees, or among loose stones, and delight themselves with the abundance that is thus plentifully afforded. And not only do they provide for their own support, with that of their relatives and young, but also of many animals who are instructed to seek out these hoards, and to supply themselves with food. Large fields are sometimes stocked with magazines, containing hazel nuts, and beechmasts, chesnuts, and acorns, covered safely up by the little animals that dwell in their vicinity, and very amusing it is to observe the sagacity of others in hunting out many of these subterraneous treasures, and pillaging the store-houses of the provident possessor. When the acorn begins to fall, those who are early abroad, may see the mice diligently employed throughout the neighbouring fields, in scratching holes, and treasuring up single acorns, which they carefully cover. These are diligently sought for by the hogs, when winter closes in, who supply themselves with these dainty viands, which they readily discover by means of their smell.

Thus wonderfully adapted for their relative condition, each species is so constructed, as readily to fill up the sta-

tion to which it is assigned. Some species serve for food, others supply warm clothing, others again, are useful in carrying burdens, or in drawing carriages. Every country has some peculiar kind of animal, which is especially adapted to the exigencies of its inhabitants. The elephant, the camel, and reindeer, are striking instances of this; but before we speak of them, it will be well briefly to notice the bear, as invaluable in the countries to which he is assigned.

This creature is aboriginal in the coldest portions of the globe, in countries too, where it is dark for nearly half the year; at which time he generally retires to deep pine-forests covered with snow. Now, why has it pleased the Creator thus to place him? why is not the bear a frequenter of the torrid zone? Because in one place he is essential to the well-being of the inhabitants; in another he would be worse than useless.

Observe the character of the country which he inhabits. It is wild and forest-like, the mountains are high and hollowed into caverns, deep pine-forests often extend for miles, and the snow forms a canopy on their branches. This is the country in which a bear delights. He must have a cavern to live in; or a deep pine forest to hide in; else the hunter would discover him, and might soon exterminate his race. Pine woods, too, are admirably adapted for his protection. The branches droop low; their sturdy arms and narrow leaves present a barrier to those flakes of snow that fall silently, till they form a transparent, and often a hard covering. Among their avenues and labyrinths he can run swiftly, notwithstanding his unwieldy size, and from among them he can diverge into caverns of such depth and magnitude, that the boldest hunters would not dare to penetrate them. But then,

these vast, and almost interminable forests, with their snowy canopies and labyrinths, are also advantageous to the hunters. They can often trace the footsteps of the bear, and come up with him in spacious areas, which the fall of trees occasionally afford. Now, if palms and aloes grew in those wild lands, instead of lofty and umbrageous pines, what shelter could they yield the hardy inhabitant of the Scandinavian forest? Their branches could not support the snow; it would lie deep upon the ground, and the fervid rays of the sun would occasion, during the short summers, a swamp of half melted ice and snow, through which neither bear nor hunter could find a path-way. That Great Being who assigns the bear to live far north, has provided him with a fit shelter, while, at the same time, the natives of those frost-bound regions are enabled readily to capture him. Some of my readers may, perhaps, be ready to say, you are endeavouring to prove that the rocks and trees of Scandinavia, and even the snow that falls for six long months are all designed to promote the welfare of a bear. By no means. I only point out one purpose which they answer, in preserving a most valuable animal for an important use; there are numberless other purposes to be answered in the economy of nature, and a few of them I may, perhaps, be able to specify.

The deep pine forests, and the hollow rocks, which these rough creatures inhabit, are generally near the sea; and the sea that washes the shores of Scandinavia, the bear's most favourite resort, abounds with fish. Every natural historian well knows that the bear prefers fish and berries to every other kind of food; and that he will never attack a man unless he is provoked, or in great want. But how can a bear catch fish? He can neither dive, nor angle.

Even this is well provided for: the shores of those stern regions are very rocky, and the billows assail them with unceasing fury; yet, the small rocks, or rather masses of huge stone, that have been hurled from their summits, form little coves, and into these innumerable fish are hurried by the waves. When, therefore, the tide recedes, they are left open to the view, and the bear has only to wait patiently for a delicious banquet.

Man is the lord of the creation; a large proportion of this fair globe is designed for his use; and hence it is, that so much skill and care are displayed for his convenience. Without the useful animal, of which we speak, human life could not be preserved in some inhospitable portions of the globe; nor if otherwise constructed, could the animal exist in those frozen climes. Let us therefore consider in reference to this, the admirable formation of the bear.

His huge and shaggy coat effectually defends him from the cold, and the fat, in which he is cased answers the same purpose; his large broad feet enable him to run with surprising fleetness on the frozen snow; and over slippery ice, along the brink of frightful precipices, down which he seldom slips. His eyes, sunk deep within his head, are well protected from the cold; his ears, too, are defended by thick hair, from being injured by the sleety snow, which often drives against them. Thus wonderfully is the bear constructed, and now for his appropriation.

The thick skin, in which he is enveloped, is used by the natives as a covering for their houses, and also for sleeping on: it protects the traveller, and keeps him warm at night. When tanned, it makes excellent shoes and thongs. For this purpose, some of the largest skins are stretched

on a frame, and exposed to the frost for several weeks. Birch-bark is also used in tanning them, and who does not know that birch-woods abound in those countries ; that the elder dies an imperishable red, and the willows a bright yellow ? The two former are often found at a great elevation above the sea, and nearly on the borders of perpetual snow. Thither the hardy native goes in quest of them, clothed in thick warm fur, and armed with saws and hatchets, made from the iron mines of Dalecarlia.

Bears' skins are also used for caps and gloves, and for the collars of sledge-dogs. Those who traverse the ice to capture marine animals, make their shoe-soles of the skin, and thus protected, they can walk with safety.

The bear is a fat animal, and the fat too is invaluable. Cold and darkness envelop the arctic regions for several weary months, and the fat in which he is wrapped, not only serves as an additional protection from the cold while living ; but when he is dead, it replenishes the lamps which shine for half the year in the dwellings of the natives.

We cannot quit this subject without referring briefly to the meteors and northern lights, which, however strange to us, when seen occasionally in these milder climates, are yet highly beneficial in high latitudes.

“ By dancing meteors then, that ceaseless shake
A waving blaze, refracted o'er the heavens,
And vivid moons, and stars, that keener play,
With double lustre, o'er the glossy waste,
E'en in the depth of Polar night they find
A wondrous day, enough to light the chase,
Or guide their daring steps to Findland fairs.”

THOMPSON.

And not only are these wondrous meteors important to the traveller, but during the darkest season of the year, the

sky is so serene, and the aurora borealis so astonishingly bright, that aided by the moon's clear beams, the Norwegians often carry on their fishery, and work at their different trades in the open air. What an astonishing harmony is here discernible! The woods and mountains, the turbulent seas, and rocky coasts, the meteors, and northern lights, the shaggy inhabitants of the deep pine-forests, the snows, and darkness, all unite to form a perfect whole. They are all subservient to the wants of man, and one part admirably tends to supply the deficiencies of another.

Noble herds of rein-deer also wander over the same inhospitable plains, through the deep pine-forests of Norway, and Lapland, in Kamtschatka, and Siberia, and frozen Greenland. Such innumerable multitudes resort to the neighbourhood of Hudson Bay, that columns of from eight to ten thousand are seen annually passing from north to south, in the months of March and April, when they are obliged to leave the woods, from which they are driven by the mosquitoes.

During summer, these valuable creatures frequent the open birch-woods, on the branches of which they browse, and in passing through them it is amusing to observe how carefully they hold their heads in an horizontal position, to prevent their horns from being entangled among the boughs, and how carefully too they choose their ways. But when on the open plain, they bound with such astonishing celerity, that they are scarcely seen before they vanish, like snow flakes, driven by the wind.

When the cold sets in, and the open birch-woods no longer afford them a convenient shelter, they resort to the deep pine-forests, and harbour beneath those evergreens, over which the snow often forms a light and trans-

parent covering. Thus protected, they principally feed on the rein-deer lichen, which often carpets the ground for many miles; and when they emerge from out their snowy citadels, in order to procure it, the traveller may see them busily employed in shovelling off the snow with their feet and antlers, at which time they generally choose an ascending ground for the convenience of reaching the surface with their lips.

This creature is celebrated for its services to the harmless inhabitants of Lapland, in those cold climes, where, during the winter months, the lakes and rivers are completely frozen, and the country is often covered with snow to the depth of four or five feet. While the snow continues falling, it is impossible to travel; but when a partial thaw takes place, the frost speedily produces a hard impenetrable crust, a slippery pavement, over which the inhabitants, by means of their rein-deer, pass with incredible celerity. "I could almost fancy," said Dr. Clarke, "that I was mounted on the magic steed of German romance, so swiftly did hill, and dale, glacier, and volcano, seem to fly beside me. "Instances have occurred, in which the rein-deer when urged to his utmost steed, has completed a journey of fifty miles without stopping; but in general thirty miles are as much as he can effect. To the Laplander, this valuable animal is a substitute for the horse, and cow, the sheep, and goat. Neither of these could subsist in his frozen land; for though the scenery in summer is exquisitely beautiful, and though the lakes and rivers are bordered with roses, and with flowers of the fairest form and brightest hue, the summer is very short, and the winter soon commences, when the whole country is enveloped for six long months in its snowy mantle. No pasturage for herds could



LAPLANDERS AND REIN-DEER

therefore be obtained, nor could the horse, or sheep, or even the hardy mountain-goat be sustained for any length of time; but the rein-deer supplies the place of these. The milk is excellent, the flesh furnishes food, the skin clothing, the tendons bow-strings, and when split, the finest thread; the horns yield glue, and the bones are manufactured into various useful articles.

Observe how wonderfully this creature is adapted to the country which he inhabits. His foot is broad, and the under-part is entirely covered with hair, as the claw of the ptarmigan, with feathery bristles, which is almost the only bird that can endure the rigour of the same climate. A peculiar mechanism also enables the rein-deer to spread wide his hoofs, when about to touch the ground, and thus is he enabled to cover a larger surface of the snow, and to be preserved from sinking into it, while journeying in his rapid course. Then he has large spreading horns, and these answer two important purposes; one for his own benefit, as I have just observed, the other for that of his master: with these broad horns, he can shovel away the snow from off the lichens in hard weather, when unable to obtain the young and juicy cones of the drooping larches. By means of his antlers, the swift creature is often yoked to a sledge, the reins are wound around them; and on he goes in his rapid career, as if scarcely feeling that he has any weight to draw.

The camel must now be spoken of. But this, some reader may, perhaps, be ready to exclaim, "is a trite subject. Every one has heard how wonderfully the stomach is constructed, and how swiftly, and how well, the creature traverses the burning deserts, to which he is assigned." True, and were I going to speak merely on these subjects, the camel must certainly be omitted. But cast

your eye on those vast tracts of burning sands, which distinguish the interior of Africa. Let us take for instance the great desert of Zahara, The Desert, as it is emphatically termed, stretching from the shores of the Atlantic, to the confines of Egypt, over an extent of more than two thousand miles : this is in most places a sandy heath of various levels, in some parts hard and calcined ; in others a deep sand ; in others covered with an odoriferous plant, which the Arabians call the the ; and which, though far superior in fragrance, resembles the wild thyme of our own commons.

In some few portions of the wilderness, thousands of sheep, and goats, and cows, are seen to pasture, while in others, nothing is presented to the eye, but desolate hills of shifting sand.

This last portion is literally a desert without water, and so it is called by the Arabs, to whom it conveys the fearful idea of intense and suffocating heat, of the total absence of all vegetable life, and of those floating surges of suffocating sand, which often overwhelm the traveller with a dreadful death. In short, this portion of Zahara is a desolate wilderness, a wild expanse, where the scorching heat of the sun-beams, confined and reflected by the hills of sand, hourly diminishes the hope of water ; and where whole caravans have perished from thirst.

Over this lonely desert, no land-marks are discoverable, and every trace of men or camels, is speedily obliterated by the shifting of the sand : camel-drivers, therefore, are obliged to observe the bearings of the sun, by day, and to trace their nightly progress by the stars. Like the ocean, it connects the countries, which it seems to separate ; and unites the regions, which must otherwise be eternally apart.



CAMELS TRAVERSING THE DESERT.

Now it is evident that no creature could exist there, unless peculiarly adapted to its localities, and yet that desert must be passed. Numerous tribes also live upon its surface, those wandering tribes, concerning whom it was declared in the earliest records of the world, "that their hand should be against every man, and every man's hand against theirs."

We find, accordingly, that a strange-looking quadruped, with a hunch upon his back, and with feet admirably constructed to pass over a hard and flinty soil, and with such an exquisite sense of smelling, as to discover water at a considerable distance, is placed in those barren deserts. The Creator has wonderfully endowed the camel with parts and qualities, adapted to the office which he is designed to fill. The driest thistle, the most thorny plant, is all the food this useful quadruped requires, and even these he eats while passing on, as if anxious not to lose a single moment. Destined to cross immense and streamless deserts, to journey over countries, not even moistened by the dew of heaven, he is endued with the extraordinary ability to lay in a store of water, sufficient for the consumption of many days. To contain this needful supply, he carries within him a kind of cistern, from which, when once filled, he draws at pleasure the required quantity, and pours it into his stomach, with the same effect, as if taken fresh from a spring, and with this he journeys patiently and vigorously, all day long, and often with a heavy load upon his back, through regions visited with burning winds, and over plains that glow with parched, and never-cooled sands. Hence it happens, not unfrequently, that travellers have been obliged to kill one or more of their camels, to preserve themselves from perishing by thirst.

The feet too, how curious they are, how well adapted to journey on a scorched and rugged way. The under part is covered with a tough, and pliable skin ; which, by yielding in all directions, enables the animal to travel with security and ease, upon a soil, that would otherwise parch and destroy the hoof.

Camels are venerated by their Arab masters, as gifts of heaven, as sacred animals, without whose aid they could neither subsist, nor journey, nor carry on their commerce. Possessing them, they not only readily obtain all which they require, but they have nothing to fear. A single day suffices to bear them at least fifty leagues into their deserts, and thus, they are very soon beyond the reach of their most powerful enemies. The best appointed armies would perish in attempting to pursue them, for their country is equally without herbage and water. Theirs is a burning sun, and a cloudless sky, plains of sand also, and arid mountains, where not a single living object either meets, or relieves the wearied eye.

Such then are the camels of Zahara : without their services, the wandering Arabs could not continue in their wild solitudes ; for the deserts neither yield them land for corn, or pasturage, nor trees with which to supply timber for a dwelling, nor running streams for the hiding-place of fish. The camel seems to unite within himself all those various gifts, which are beneficently showered forth in the temperate regions of the globe. His milk supplies the place of that which is yielded by our cattle, and is far more nutritious ; his hair is wrought into various articles of dress ; his skin supplies a covering for the tent, and consequently sheep are unnecessary to the Arab.

We may further remark that the burning climate of Africa, is peculiarly adapted to the constitution of the camel.

Place him in temperate Europe, and he would pine away. The frequent showers that cause our fields to bring forth abundantly would be death to him, and just in the situation where his services are no longer wanting, he would droop and die.

This valuable creature is more completely subjugated than any of the domestic species. Dogs and horses, swine and sheep, oxen and asses, are found wild in different portions of the globe, whereas the Arabian camel, or dromedary, the *camelus dromedarius*, with one hunch is totally enslaved, for none have ever been discovered in their primitive condition of liberty and independence. They are common throughout the vast extent of Turkey, Persia, Egypt, Barbary, and Arabia, but more especially in Arabia, of which they are the symbol, when found on the coins of any other nation ; while the Bactrian camel, (*camelus bactrianus*,) generally prevails in Russia and Siberia, and is seen in the milder parts of Asia, in those especially, between India and China ; a moister soil, and moderate climate being more congenial to their habits, than the dry and parched regions of Arabia, or Africa.

This extraordinary phenomenon in Natural History, the complete domestication of the dromedary, establishes the fact, that after the catastrophe which occasioned the destruction of innumerable living creatures, of which we discover fossil exuvixæ, Noah and his family first settled in the East.

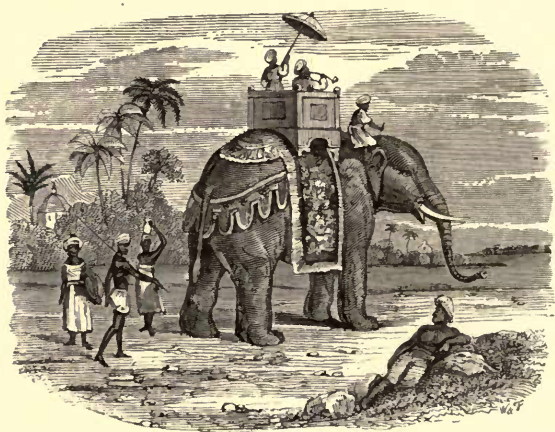
Light is thrown upon this remarkable coincidence only in the Mosaic record. That record tells us, that the whole race of camels perished with all other animals in the flood of waters, excepting that one solitary pair, the male and his female, which the Most High reserved to keep them alive upon the earth. Thus, the camel race, being dimi-

nished to two individuals, became reduced under the power of man, and they alone of all the unclean beasts, or such as parted the hoof, were especially valuable to him. When, therefore, the patriarch and his family quitted the ark, and established themselves in Asia, this important race was carefully preserved; individuals could not be spared to run wild, their services were continually required in the sultry regions of the globe, and they alone no more returned to their early state of liberty and independence. Hence, they have ever been considered as pertaining to the hottest portions of the East, and have descended in a direct line from the patriarch, who introduced them, as peculiarly associated with one branch of his family. And the same care, which, doubtless, prevented their escape to freedom in the earliest ages of society, is still exercised for their preservation.

The domestication of this valuable species is, therefore, a living and perpetual evidence, both of the great calamity in which all, excepting a reserved few of the animal creation, perished, and of that also which established the human race on the Asiatic continent.

Bishop Watson remarked that he never saw a Jew, without beholding a living testimony to the truth of the Old Testament. Granville Penn observes, with equal force, that he also never looked at an Arabian camel, without beholding in it a living testimony to the truth of that stupendous catastrophe, which loaded the soils of northern Europe with animal spoils from off the perished earth, and fixed the ancestors of the present race of mankind in the Western regions of Asia.

In turning from Sahara to the East, we discover a huge animal that is all important beneath the sultry regions of the line: in those parts especially, where great bulk and



AN ELEPHANT WITH HIS TRAPPINGS.

strength is especially required for purposes of commerce. This is the elephant, without whose aid many kinds of labour could not be carried on. His astonishing strength enables him to bear a tower filled with armed men upon his back, or to assist in drawing heavy loads. For this purpose his legs resemble pillars, and his broad feet enable him to walk with safety; his senses of seeing and of hearing are remarkably acute, and, lest he should be oppressed with heat, he is in general merely covered with a skin. He could not endure a load of fur, and when harassed by stinging insects, he plunges into the nearest river. No animal is so intelligent and powerful, nor yet so gentle, for he rarely exerts his strength, unless to benefit his master.

If we look towards the temperate regions of the globe, a very different race of animals is every where conspicuous. Amongst these we recognise the genus *Bos*, which are spread throughout such portions of the habitable globe, as are susceptible of tillage, that no where may their services be wanting.

The rein-deer could not pass his frozen barrier without injury or deterioration; the camel would perish if removed from his sandy clime; the elephant could not live in this country with comfort; but, instead of these, we discover a race of valuable animals that are admirably adapted for every necessary purpose. The cow is often seen in the green-fields, to which domestication has assigned her, and beside her grazes the peaceful sheep; high hills are a refuge for the wild goats, and our plains support a fine race of horses. Various kinds of dogs faithfully attend their masters, either as watches to keep off the nightly robber, or to guard the flocks and herds, to assist in hunting, and even to draw small carriages. The

instincts of all are various, and each species is beautifully adapted to the little sphere that it has to fill. The cat, too, man's humble companion, employs her services, whenever they are wanting, and the quiet donkey is ever ready to assist his master.

SEVENTH DAY OF CREATION.

Thus the heavens and the earth were finished, and all the host of them. And on the seventh day, God ended his work which he had made, and he rested on the seventh day from all his work which he had made.

And God blessed the seventh day, and sanctified it, because that in it he had rested from all his work which God created and made.

GENESIS ii. 1—3.

Here finish'd he ; and all that he had made,
View'd, and behold all was entirely good ;
So ev'n and morn, accomplished the sixth day ;
Yet not till the Creator from his work
Desisting, though unwearied, up return'd,
Up to the heav'n of heav'ns, his high abode,
Thence to behold this new-created world,
Th' addition of his empire, how it show'd
In prospect from his throne, how good, how fair,
Answering his great idea. Up he rode,
Follow'd with acclamation, and the sound
Symphonious, of ten thousand harps, that tun'd
Angelic harmonies ; the earth, the air,
Resounded.

The heav'n and all the constellations rung,
 The planets in their stations list'ning stood,
 While the bright pomp ascended jubilant,
 Open, ye everlasting gates ! they sung,
 Open, ye heav'ns ! your living doors ; let in
 The Great Creator, from his work return'd,
 Magnificent ; his six days' work, a world ;
 Open, and henceforth oft, for God will deign
 To visit oft the dwellings of just men,
 Delighted ; and with frequent intercourse,
 Thither will send his winged messengers
 On errands of supernal grace. So sung
 The glorious train ascending : he through heaven,
 That open'd wide her blazing portals, led
 To God's eternal house direct the way,
 A broad and ample road, whose dust is gold,
 And pavement stars, as stars to thee appear,
 Seen in the galaxy, that milky way,
 Which nightly as a circling zone thou seest
 Powder'd with stars."

MILTON.

Such was the day of rest, that day on which the Almighty ceased from his work, when he contemplated the glories of creation, and pronounced that all was good.

Great and inestimable blessings have ever been derived from a due observance of the sacred ordinance which appointed that all time should be measured by a perpetually recurring calendar of seven days. For while the Most High stationed in the heavens those glorious luminaries which divided time into large portions, and attracted the attention to natural objects, he also provided by the sanctification of the seventh day, a distinct calendar that should direct our thoughts especially to Himself. The first day of creation commenced the first year, and the first month, as shewn by the phenomenon of the fourth day ; and the end of the first week was testified by the sanctification of the seventh day. This was evidently the order in which the new creation and the system of time began,

and this order has proceeded uniformly and without interruption from that period to the present, and will thus proceed even when the earth shall be filled with the knowledge of the glory of the Lord, as the waters cover the sea. Habak. xi. 14.

The day, thus consecrated from the beginning, and which an ancient writer has termed the birth-day of the world, was, most probably, neglected during that unhappy period, "when God saw that the wickedness of man was great upon the earth, and that every imagination of his heart was only evil continually." And as time passed on, and the precepts of Noah were forgotten or unheeded by his descendants, the remembrance of that blessed day might even again have passed from the minds of men, till it pleased the Most High to call his people out of Egypt, and to establish its observance by a perpetual memorial. And as the day was observed by the Jewish church in memory of the work of creation, and their own wonderful deliverance from Egypt; so the first day of the week has ever been observed by the Christian church, in memory of the work of redemption, and of our Lord's triumph over death.

This day was denominated by the primitive Christians the Lord's day, as we learn from the first chapter of the Revelations, and the tenth verse, for the beloved disciple tells us that he was in the spirit on that day, and heard behind him a great voice, as of a trumpet. St. Paul too, notices the especial devotion of this day to religious purposes, during the narrative of his journey to Macedonia, where he mentions that upon the first day of the week, when the disciples at Troas, came together to break bread, he preached unto them, ready to depart on the morrow, and continued his speech till mid-

night.* The directions also, which the same apostle gives to the Corinthians regarding their contributions for the relief of their suffering brethren, plainly allude to their religious assemblies on the first day of the week. "Now concerning the collection for the saints, as I have given order to the churches of Galatia, even so do ye. Upon the first day of the week let every one of you lay by in store, as God hath prospered him, that there be no gatherings when I come." 1 Cor. xvi. 1, 2.

The New Testament is silent with respect to the precise time, when the first day of the week was substituted for the seventh, but the above texts prove it to have been done during the life time of the apostles, "of those who knew the mind of Christ;" and we learn from Pliny's celebrated letter, and other monuments of the earliest ages of Christianity, that the first day of the week was held sacred all over the Roman world, wherever the name of the Redeemer was confessed and adored.

It is, therefore evident, that the first day of the week was appointed to be held sacred by our Lord, either when he made all things concerning himself known to his two disciples, as they journeyed to Emmaus, or to all of them, during the forty days, when he spake to them of things pertaining to the kingdom of God.

This blessed day was in the primitive ages of Christianity, called indifferently the Lord's-day, or the First Day of the Week, whilst the heathens, who derided the observance, knew it only by the appellation of Sunday. This is to me a beautiful appellation, and one, which though of heathen origin, a christian may well retain. The Sun of Righteousness then arose with healing in his wings. He arose from the darkness of the tomb; who is spoken

* Acts xx. 7.

of in another place, as the true light, which lighteth every man that cometh into the world."

We may further notice that the Lord's-day was never denominated the Sabbath, either in the New Testament or by ecclesiastical writers, nor indeed I believe by heathen ones: the term Sabbath is constantly appropriated to the seventh day; and consequently does not refer to the Christian's Lord's-day.

Truly, this hallowed day is a kind and beneficent appointment. Six days are allowed for labour, wherein the poor man has time to earn his bread; the man of business to manage his concerns, and those whom the Lord has placed in high stations, to take the oversight of all that he has committed to their care. Were the Lord's-day abolished, the body would become enfeebled, and the mind be too much engaged about the things of time. But the merciful Creator of the universe, by reserving one day in seven for his own immediate service has obviated this. And not only has he released his creature man from labour on that day, but the animal creation also. It seems as if the whole creation might then break forth into singing, and be at rest. Man is not called to go forth to his labour till the evening; the wearied horse and ox lie down in their green pastures beside the clear waters, which God has given to refresh them; the yoke is taken from off their neck, and all creatures that are assigned for the use of man, should go free. This was the original design of the Creator, and thus ought it ever to be observed.

"Keep the Sabbath-day to sanctify it, as the Lord thy God hath commanded thee.

"Six days thou shalt labour, and do all thy work: But the seventh day is the Sabbath of the Lord thy God, in it thou shalt not do any work, thou, nor thy son, nor thy

daughter, nor thy man-servant, nor thy maid-servant, nor thine ox, nor thine ass, nor any of thy cattle, nor thy stranger that is within thy gates ; that thy man-servant and thy maid-servant may rest as well as thou."

And why is the strict observance of the latter clause especially enjoined ? From the remembrance of past afflictions in the land of Egypt.

" Remember that thou wast a servant in the land of Egypt, and that the Lord thy God brought thee out thence through a mighty hand, and a stretched-out arm : therefore the Lord thy God commanded thee to keep the Sabbath-day." Deuteronomy, v. 13, 14, 15.

But man is not only permitted to cease from labour, to give rest to his servants, and his cattle, but he is called upon to adore the God, who loved him ; the Saviour, who died to redeem him, the Holy Spirit, who sanctifies and comforts him ; to look to the rock from whence he was hewn, and to the hole of the rock from whence he was taken, and to rejoice in the hope of unutterable blessedness, at the right hand of the Majesty on High. Oh ! there is an holiness in that day, which sheds abroad its blessedness on the labours of the week, to him, who remembers that it is to be kept holy ; a calmness and a peace, which sweetens every toil, and brings to mind the beautiful description of the poet, when speaking of the influence of that love, which is truly the Christian's inheritance.

Oh ! love's a flower that will not die
 For lack of leafy screen,
 And christian hope can cheer the eye,
 That ne'er saw vernal green.
 Then be ye sure that love can bless,
 E'en in the crowded loneliness ;
 Where ever-moving myriads seem to say,
 "Go, thou art nought to us, nor we to thee, away !"

There is, in the loud stunning tide
Of human care and crime,
With whom the melodies abide
Of th' everlasting chime.
Who carry music in their heart,
Through dusty lane, and bustling mart,
Plying their daily task with busier feet,
Because their secret souls a holy strain repeat.

KEBLE.

Had man never fallen, the Sabbath would doubtless have been to him a day of peculiar communion with his Maker, —a day, when the sons of God, who sung together as this fair world emerged from darkness, might in some especial manner have rejoiced with him. Even in this our lost condition, what a peaceful, what a blessed day, is the day of rest? It always seems to me that the sun shines brighter, and the flowers open more sweetly to the sun on that day, than on any other. And, surely, independent of the pleasing thought, which often greets us on first awaking, that all the usual concerns of life are to be laid aside, and that the mind is not to take thought for any thing of this earth's care, there is an indescribable feeling connected with this sacred day, from its recalling the glorious event of our Lord's resurrection.

And sweet it is to hear the village bells ring out, to find that all the wonted sounds of active life are laid aside, that the busy mill is at rest, and the creaking sound of the heavy waggon; to look over the smiling landscape, and see the quiet animals that are wont to labour hard, grazing undisturbed in the green lanes, or in their own calm meadows: to pass with light steps, and lighter hearts, across the common, and over the village green; to see the neighbours coming forth, and meeting with kind looks in the house of prayer: to enter that house and to feel that the

world is shut out ; to be able to say to all its cares, as said Nehemiah to those who vainly endeavoured to interrupt him, " I am doing a great work, so that I cannot come down ; why should the work cease while I leave it, and come down to you ?" *

* Nehemiah vi. 3.

HAPPY CONDITION OF OUR FIRST PARENTS.

GOD created man in his own image, in the image of
God created he him ; male and female, created he them.

GENESIS i. 27.

THUS dignified and happy, our first parents were placed in the garden of Eden, with supreme dominion over all the joyous creatures by whom they were surrounded. One only rule was prescribed to these highly favoured beings as a perpetual evidence of their subordination ; one only object was reserved and prohibited out of the universal grant ; and this, though trivial in itself, was amply sufficient for the designed end. It was intended to prove, whether the beings who were thus bounteously endowed, acted with a due sense of their subjection, or whether they could ever be unmindful of their divine Benefactor. That slight and solitary privation was imposed upon the declared principle of retribution : “ He who is faithful in that which is least, is faithful also in much ; and he who is unjust in the least, is unjust also in much.” Under the easy trial, man failed, he was found unfaithful in a small matter, and was, therefore, driven out of that blissful land, which perfect obedience would have preserved to him : he fell, and with him fell the fair and beautiful creation, by which he was surrounded.

Sixteen hundred and fifty-six years passed away, and the principle of disobedience which our first parents introduced, gradually ripened into the fulness of crime, and spread its destructive influence through all classes of society, with the exception of one family. Till at length, the Most High, saw "that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually."

"And the Lord said, I will destroy man, whom I have created, from the face of the earth; both man, and beast, and the creeping thing, and fowls of the air, for it repenteth me that I have made them. But Noah found grace in the eyes of the Lord; and God said unto him, The end of all flesh is come before me, for the earth is filled with violence through them, and behold, I will destroy them *with the earth.*" Genesis v. 5, 7, 8, 13.

Very remarkable is the testimony of St. Peter, who, adverting in his second epistle to the catastrophe of the deluge, expressly affirms, "that the world which then was, being overflowed with water, perished." iii. 6, 7. To the world which then was, he opposes the world that now is; and he proceeds to declare that the present earth is reserved unto fire, as the past one, "being overflowed with water, perished." He thus enables us to judge the extent of the former destruction, by affirming the destruction of both to be equal, and, therefore, rendering them rules for mutually explaining one the other.

We have also another, and still more ancient testimony to the same fact, in the book of Job; that exquisite book, concerning which, Bishop Patrick remarks, that its grandeur is as far superior to all other poetry, as thunder is louder than a whisper.

"Hast thou marked the old way, which wicked men

have trod, who were cut down, out of time, whose foundation was overthrown with a flood." Job xxii. 16.

The Greek interpreters, in varying the import of this remarkable passage, increase its force, for thus they render it :

"Their foundations are become an overwhelming flood."

The author of the book of Job, therefore, affirms, that the waters of the flood destroyed not only the wicked race, but also the foundation of the dwelling on which they had existed. The same ancient record adverts pointedly, in another place, to the two vast operations, by which the Most High first made dry the earth, and then submerged it. Speaking of the irresistible power of the Almighty, he appeals to facts :

"Behold, he withholdeth the waters, and they dry up, also, he sendeth them out, and they overturn the earth." Job xii. 15.

But if that portion of the earth on which Cain and Abel, Methuselah, and Lamech, with the successive generations from Adam to Noah, passed the time of their probation perished, indeed, according to the menace of the Lord, what was that second earth, upon which the ark rested by his providence, and on which the race of men have subsisted till the present day ? From whence did it acquire its origin ?

We have reason to believe that a violent disruption of the solid surface, produced at first a bed, into which the waters were drained off, while the remainder of the earth was as suddenly clothed with vegetation, and peopled with innumerable living creatures. That portion, which was then so clothed and peopled, was now in its turn, to sink and disappear. The same commanding word which caused the first disruption, now depressed that portion below the

level of the first sea bason, and thus the waters flowing into a still lower level, left their bed exposed and dry, and caused it to become an habitable earth. Philosophy enjoins us to refer similar effects to similar causes; and since the sacred record, contains nothing that is opposed to the application of this principle in the present instance, we must believe that the production of a second earth was effected by means exactly corresponding to those which had given origin to the first earth.

Vast causes were put in action, and vast effects produced, the fountains of the great deep were broken up, and the windows of heaven were opened, phrases which plainly imply the inroad of the sea upon the land, and the descent of heavy rains.

By the continual action of these tremendous agents thus employed by the Most High, his awful purpose was at length fully effected. Every living thing was swept away, excepting the very few that were saved in the ark. Meanwhile that ark and its inhabitants were safely upheld amid the warring elements, and rested at length upon the mountains, which after the waters had subsided, were denominated Ararat, in the regions of Armenia.

Many months had elapsed since Noah and his family went into the ark, attended by all the living creatures whom the Lord inclined to follow them; since he left a mocking and rejoicing world, and looked out upon an earth, that exhibited no trace of man.

“And it came to pass at the end of forty days, that Noah opened the window of the ark which he had made:

“And he sent forth a raven, which went forth to and fro, until the waters were dried up from off the earth.

“Also he sent forth a dove from him, to see if the waters were abated from off the face of the ground;

“But the dove found no rest for the sole of her foot, and she returned unto him into the ark, for the waters were on the face of the whole earth; then he put forth his hand, and took her, and pulled her in unto him into the ark.

“And he stayed yet other seven days; and again he sent forth the dove out of the ark :

“And the dove came in to him in the evening : and, lo, in her mouth was an olive-leaf plucked off; so Noah knew that the waters were abated from off the earth.

“And he stayed yet other seven days, and again he sent forth the dove, which returned not again to him any more.

“And it came to pass in the sixth hundredth and first year, in the first month, the first day of the month, the waters were dried up from off the earth : and Noah removed the covering of the ark, and looked, and behold the face of the ground was dry.

“And in the second month, on the seven and twentieth day of the month, was the earth dried.” Genesis viii. 6—14.

The sacred record thus clearly points out the period when the waters having been diffused a second time over the earth, began to leave their ancient bed, till it became dry land. That period was at the end of one hundred and fifty days, or five months, from the commencement of the flood. As long, most probably, as any of the ancient lands remained to repel the action of the sea, its agitation and reflux would continue; but when the last firm land disappeared, these effects must have ceased also. The waters then became assuaged, and as their new bed deepened more and more, their draining off became more apparent. But while thus diminishing in depth, they were acting with enormous power upon the yielding

materials of their basins, and producing excavations and accumulations that must have greatly altered its surface. Had the ancient land sunk at once, the immediate influx of the ocean, in order to fill up the vacuum, would have hurried the ark into its enormous vortex; whereas the Divine Record tells us, that the ark went upon the face of the waters. The flowing off of the waters was therefore gradual; like those of a lock, in which a vessel descends almost imperceptibly from a higher to a lower level: So that the inhabitants of the ark were most probably insensible to the operation, and when at length it rested among the rocks of Ararat, those rocks might seem to them as the inundated heights of the land which they had left.

“It is unnecessary,” says the accomplished Cuvier, “to assert that the continents of the antediluvian world form the basin of the sea; there is no longer any difference of opinion among geologists on this subject; they all agree that the ocean has changed its bed. Every thing concurs to indicate that this earth has undergone the most important revolutions; sea shells and the bones of land animals encrusted in the mountains, clearly prove this most extraordinary fact; they also show that animals inhabited them before the mineral masses in which their remains are imbedded, could have been formed. Hence it is evident that those masses were not always solid. Every thing further concurs to indicate, that the plains of our present earth, as those of Holland, Lombardy, and Alsace were deposited beneath a tranquil water; and that the present condition of the earth dates only from the retreat of that water, and that the date is not very ancient.

“The lowest and most level parts of the earth, when penetrated to a great depth, exhibit nothing but horizontal strata composed of various substances, and generally

containing innumerable marine productions. Similar strata and productions, compose the hills, even to a great height; and sometimes the shells are so numerous as to constitute the entire body of the stratum. They are generally in such a state of preservation, that even the smallest of them retain their delicate proportions, and even their sharpest edges. They are found at heights far above the level of the ocean, and in places to which the sea could not be raised by any existing cause. They are not only enclosed in loose sand, but often encrusted on all sides by the hardest stones. Every portion of the habitable globe exhibits the same phenomena, and we are therefore led to the conclusion, not only that the sea at one period covered the surface of the earth, but that it must have remained there for a long time, and in a state of tranquillity, which circumstance was necessary for the formation of deposits so extensive, so thick and solid, and containing *exuviae* so perfectly preserved."

Thus far the report of this accomplished geologist, who has clearly proved that the sea at one period occupied our present continents. And now a question naturally arises respecting those monuments which also evince the great primeval convulsion that attended the formation of the bason of the former sea, our present habitable earth.

Are not all those pointed pyramids, which seem as if detached from the mountains, and shoot up into the air, those bare needles which rise like pinnacles from the Alps, eloquent, though silent witnesses of the destruction of the soils that once encompassed them, and of which they formed a part? Those projecting points which jut out of the mountainous masses, are of a similar character, and further indicate the destruction of the surrounding soils. It is evident that such obelisks were not originally so formed, but that the parts which apparently are wanting

have been broken off and swept away. We can discern around them other summits, whose bases are equally rooted to the soil, and whose fractured sides indicate past ruin. Those mighty blocks of granite rock, which are found in certain soils, and are shown by every indication to be lying near the places where they were broken, are striking proofs of the depression of the soil.

We have already mentioned that this depression was most probably occasioned by volcanos and earthquakes, and that such were the agents which the Most High employed in producing this great convulsion. It will be interesting to mention a few instances in which important consequences have resulted from their operations.

Earthquakes are most frequent in the neighbourhood of volcanos. There is, consequently an intimate connection between them, and of these the most common and best attested effects, are cracks and crevices wrought in the mineral strata, when they experience a great concussion. When these concussions are sufficiently violent to fracture, either the primordial vaults beneath the soil, or such as are formed by the conjunction of the lava, or to overturn the pillars by which they are sustained, the mountains and soils must necessarily fall into the gulf from which they had arisen. Thus was the highest mountain in Jamaica* suddenly swallowed up, and replaced by a lake; thus, too, in Iceland,† a similar catastrophe occurred; and in Java,‡ its largest volcano, of which the base was more than twenty miles, disappeared in a moment, after a few short and violent eruptions, and carried down with it, forty villages, and two thousand inhabitants. Equally tremendous was the vanishing away of the volcano of the Peak, in one of the Molucca islands.§

* 1692. † 1772. ‡ 1698. § 1698.

This volcano was visible to the distance of thirty miles, and served as a light-house to vessels; but in the midst of a violent eruption, it suddenly disappeared, and its place is filled by a lake at the present time. We have seen the Carquairazo crumble away, and overwhelm the neighbouring districts with its mud. And ancient tradition relates, that the volcano of the Altaz de los Collanes, in Peru, the height of which surpassed the lofty Chimborazo, sunk down after eight years of continued eruption; and its inclining eminences only exhibit, at the present day, traces of its destruction. In the soils occupied by extinct volcanos, we still perceive indications of deep sinkings, particularly in many lakes, which are presumed to be the sites of ancient craters or volcanic mountains; such are those of Laach, near the abbey of the same name, a few leagues from Andemach; such also is the little circular lake of Pavez in Auvergne.

But what is the immediate cause which gives action to these powerful agencies? Reasoning from analogy and the extraordinary fact, that such volcanos as are in activity, are situated on rocks or islands not far from the sea, we argue, that the sea having penetrated into the volcanic cavities, was the real cause of the tremendous eruptions which prepared the bed of the ancient sea. We know something of the force of steam, yet the most powerful steam engines can hardly convey to us an idea of the might which it is capable of exerting in caverns, whose sides are several thousand yards in thickness, and which sustain such mountains as Etna and Chimborazo.

These instances prove what has been done within comparatively a recent period; and if we look abroad upon, and into the earth, we continually witness monuments of primitive disruption and downfall, in all the primordial

mountains; of depression and subsidence in the valleys; of disorder in all the primitive strata; and of volcanic action, coeval with the origin of all this ruin. We may, therefore, reasonably conclude, that our continents exhibit irrefragable monuments of the great convulsion which formed the bason, or reservoir of the primitive sea.

The chains of the highest mountains, which resisted that terrible convulsion being deeply fixed and rooted in the very nucleus of the globe, remain in the positions where they were first formed, and exhibit imperishable examples of their early formation. The distribution also, and outspreading of the depressed parts into plains and valleys; the particles of fractured rocks in every form of stone or pebbles, of sand or quartz, together with the enormous quantities of marine organic remains, all clearly prove, that the ancient sea occupied for a long time this portion of the globe, which has been rendered the habitation of mankind by the receding of that sea.

Thus far, then, two great convulsions of the earth's surface, are fairly established. The first, anterior to the production of animal or vegetable matter; the second after the production of both. The first, occasioning through the violent action of mechanical agencies, directed by the Creator, a bed to receive the waters, which had previously been diffused over the whole earth; the second, producing under the same direction, and by a repetition of the same operation, a new bason into which the waters were transferred from their former bed. It also establishes the fact, of the sea having occupied that former bed, during the lapse of time, that intervened between the creation and the deluge; and finally, of that former bed, being now the earth which we inhabit.

In pursuing this interesting portion of our subject, we are struck with the extraordinary fact, that the exuviae of animal species, now subsisting only within the torrid zone, and those of species which no longer exist at all, are found together in the soils of the most northerly latitudes. This is the more extraordinary, as the greatest order everywhere subsists within the habitable globe. Some species can only live in salt water, others in fresh, others again are confined within the torrid, and others would perish if they were removed from the frigid zone; whereas in the strata of the earth everything is dislocated. The remains of animals, which can exist only in the depth of ocean, are found kneaded into rocks, that form the summits of high mountains; the bones of such as inhabit the torrid zone, are found buried in the frozen soil of the polar regions. Almost everywhere, relics are discoverable, both of animals and vegetables, very different from those that now exist. All these indicate, that the place of our habitation has undergone great changes, and important revolutions.

This is a wonderful phenomenon. How are we to account for all these animal varieties being jumbled together?

We know that the ancient habitable portion of the globe, perished beneath the waters, and that its animal and vegetable remains, are thickly scattered beneath the soil, over which the present race of men, have placed their habitations.

Let us now endeavour to find the cause of this wonderful phenomenon, and in doing so, we shall again avail ourselves of the valuable information that is contained in the "Comparative Estimate."

The incessant torrents of rain, and consequent over-

flowing of the rivers, during forty days, must have so drenched the surface of the earth, that the moveable soils were rendered capable of being taken up in solution by the waters of the sea, and fitted for precipitation on a new surface. The vegetable garment, with all its plants and herbs, its woods and forests, finding no longer any support in the soft mud, must then have been swept away with the whole animal creation. These would float for a longer, or a shorter period, according to their weight, or size, and be driven by winds and currents in vast accumulated masses, and in various directions. Some might have sunk immediately, others might have been borne up for many days, as they were more or less buoyant.

Fearful must have been the sight of such accumulations, uprooted and entangled together, and moving on the bosom of a boundless ocean, as well as of all the races of animals, crowded confusedly in close contact, and great numbers.

We also know that the Most High caused a wind to pass over the earth, that the waters might be assuaged. This must have been a mighty wind, hurrying all things before it, and sufficiently accounts in its operation, for the bringing down of the remains of northern animals to deposit them beneath the Line; or the driving back of such as floated in the regions of the equator, towards the north. Great and furious eddies must have been formed by the operation of this mighty wind; currents too, by the reappearance of high rocks, and headlands. An advancing sea, also often floats, and conveys extraneous substances into the rear of its waters. In reference to which, we may observe, that the great Atlantic flood, which flows to the eastward, and of which a part is received into the Bay of Biscay, being stopped by the western coast of France,

and confined by the northern coast of Spain, escapes to the north-westward, and pursues its course, partly into St. George's Channel, and partly along the western side of Ireland. This flood, continually casts up articles of various kinds, the productions of the countries, along the coast of which it flows : it is no other than the reflux of the oceanic waters, which are impelled by the equatorial current on the eastern coasts of America ; which current, propelling its northern branch, along the coast of Brazil, into the gulf of Mexico, constrains the waters of that gulf to rush through the Straits of Bahama, in what is called the gulf stream, while the general mass falls back to the eastward, by the common law of equilibrium.

It is, therefore, evident, that as the waves of the sea, which strike an opposing coast, are constantly following one another, so the preceding waves, which can advance no farther, recoil by their own force. And thus a general recoil of the agitated waters, is a necessary and inevitable consequence, when checked by a bold and rocky coast.

This effect is very obvious in the sea, which moves westward from Africa and Europe, and which is compelled by the opposition of the American coast, to flow eastward towards the point from which it came. Hence it happens, that floating bodies are often transported from thence to the shores of Europe. A curious fact in the phenomena of the ocean, and one which enables us to understand, how easily the "shoreless ocean, that tumbled round the world," having received an extraordinary impulse which caused it to cover countries gradually sinking in the southern ocean, might recoil upon what is now Siberia, when emerged from the waves, and strew over it the spoils which those countries had successively delivered over to the action of its waters.

Ocean's ancient bed, which had consisted of loose or fractured materials, and been subjected for nearly two thousand years to the action of water, must have presented in many parts, a yielding paste or mud. No doubt a considerable portion of the earth's spoils, were buried in that mud, by their own weight, or by the weight and ordinary action of the waters that rolled above them. Others might become immersed, by the violence of the sea, in the latter stages of its retreat, when it rushed like an overwhelming torrent into the new abyss; into the place which was appointed for its reception. The Bore, that extraordinary high tide, at the mouth of the Amazon, and other rivers on the eastern coast of America, furnishes a striking instance of the amazing force of the sea, while in violent action, and of its facility in burying large bodies. During the time of the high tides, the sea, instead of taking six hours to rise, as is usually the case, attains its highest elevation in the space of one or two minutes. The sight is fearful, and the sound equally terrific. In one moment, a stunning noise is heard at the distance of one or two leagues, which announces the approach of this terrible tide. In proportion as it advances, the noise increases, and presently the spectator sees a moving wall of water from twelve to fifteen feet in height; then appears a second, then a third, and often a fourth, which follow close upon each other, and occupy the whole breadth of the canal; for this wonderful phenomenon is most remarkable between Maraca and the North Cape, at the point where the great canal of the river Amazon is confined by the islands. The surge still continues to advance with prodigious rapidity, breaking down and carrying away every opposing barrier. Condamine relates that he has seen an extensive tract of soil borne off by this tremendous

tide, that large trees are often uprooted by it, and that wherever it passed, the coast on either side the river, was laid as smooth as if it had been intentionally swept.

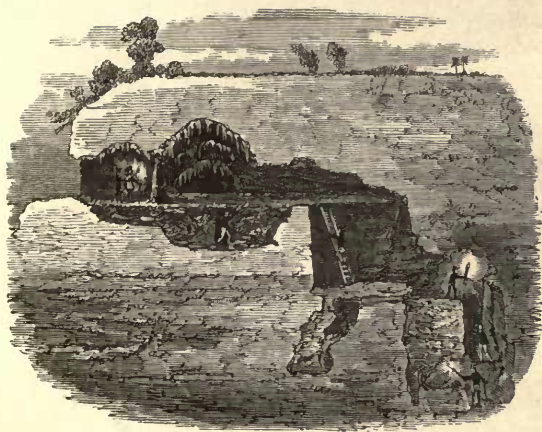
Of the power of such a mighty tide to bury large bodies, we may record the striking fact, that at the mouth of a river in Nova Scotia, a similar bore engulfed a schooner of thirty-two tons, laden with live-stock. This schooner was lying with her side to the bore, as it came rapidly up the river, and was then about ten feet in perpendicular height. No sooner had the mass of water reached the vessel, than it was instantly turned over and over, like a barrel, and as instantly disappeared. After the tide ebbed, the schooner was observed to be so entirely absorbed by the sand and surge, that the upper rail of the deck was alone visible.

Thus, then, we find in the established order of things, means, by which the bodies of elephants, or camels, of rhinoceroses, or lions, might be transported from the torrid zone to the north of Europe; and by which they might be buried at all the various depths in which they are now found, either in England, or Siberia; and this without requiring any change, either in the species, or the climates. The certain knowledge which we possess, that the animal and vegetable creation, were swept away by an overwhelming ocean; and that this ocean was fully able to transport them by means of its reflux, in a contrary direction, to every climate, satisfactorily accounts for the discovery of their remains in the strata of our earth. It also evinces the incongruity of the assumption, that those animals and vegetables, must necessarily have existed, on the very spots, beneath which they are bedded, and, therefore, the uselessness of speculating on, how could they have lived there.

It is curious to observe the very different situations in

which these animal exuviæ are deposited. Some are separately, and deeply buried in sandy, calcareous, or argillaceous soils : others are found in caverns, in multitudinous masses, as those of England, Hungary, and Germany. Some geologists have endeavoured to account for this variety, by supposing different revolutions on the earth's surface. But, let us remember, that when the countless myriads of animals that were transported by the waters, finally sunk beneath them, their remains must have found very different resting places. Some would sink into the mud, or sand, or clay, others might fall upon a rocky bottom, in which were spacious cavities. These would not be bedded like the others, but would be gradually rolled, or drawn into those cavities, by the action of the water, as it continually entered and returned. It is therefore evident, that if the soil was not soft to receive them, they would be urged onward into the nearest cavern, where they would afterwards be found in confused masses. We may also notice the remarkable fact, that no apparent injury has been sustained by those remains, as if they had come into contact with rocks and stones, during their watery career. Those remains were no doubt lodged, before they were stripped of their integuments, and many weeks did not elapse, as we learn from the Mosaic record, before the sea finally abandoned them. This solution will, perhaps, account for a phenomenon, that has much embarrassed many speculators. Their diversity of position is also the necessary consequence of the circumstances by which they were bedded, or rolled into caverns, with the whole force of the retiring water.

Thus do all these things concur in testifying that the bodies of such animals, as abound in the northern regions, were transported thither by the united fury of the waves,



VERTICAL SECTION OF THE CAVERN
AT GAYLEURENTH, IN FRANCONIA.

and of that great wind, which was made to pass over the surface of the water.

Proceed we now to consider the most remarkable phenomenon in this momentous history.

The sacred historian relates, that the same catastrophe which caused the almost universal destruction of the animal creation, caused, likewise, that of the whole human race; with the exception of one isolated family. Yet strange to say, in all the extensive moveable soils, wherein the bones of quadrupeds are thickly scattered, no human remains have ever been discovered. And yet, their bones are equally durable with those of the brute species. On this extraordinary fact, a theory has been established, which endeavours to prove that the human race did not exist at the period when those fossil bones were buried, and in the countries, where they are found, though, perhaps, existing elsewhere.

But if we carry back our thoughts to that tremendous era, when the place of man's habitation sunk into the abyss, and contemplate the fact, as far as we are able, it will appear evident, that a great difference must have existed between the human race and the animal creation, under the circumstances of that unparalleled catastrophe. Animals being but slightly endowed with forethought and reflection, are prompted by their fears in any circumstances of alarm, to congregate together, and thus they are often seen to await, in trepidation, the evil from which they are unable to escape. The animal race, therefore, when surprised by the hideous uprooting of every thing around them, or by the sudden slipping away of the rock, or land where they chanced to be assembled, would be carried off in great numbers by the inundation. The human population, on the contrary, being endowed with obser-

vation, and strongly actuated by hope and fear, would anxiously retreat before the advancing waters, most probably to the highest point of land : Until at length, being assembled on that narrow spot of earth, which alone remained to them, amid the increasing inundation, they would not have been washed by degrees into the water, and carried away by any reflux, like the poor affrighted animals that crowded together ; but absorbed into one fearful vortex, when the last portion of firm land sunk beneath their feet. They would then suddenly be submerged in the depth of the new sea, where their bones must remain for ever beyond the reach of man ; and doubtless it is quite consistent with all the dealings of the Lord, that while the remains of a vast proportion of the brute creation were scattered over the surface, that was to constitute the new earth, the human race, whose heavy crimes had brought down from heaven so tremendous a judgment, should perish in the same locality with the ancient earth on which their sins had ratified the primeval curse.

Thus were they “ cut down out of time, whose foundation was overflowed with a flood.” Job xxii. 16.

Let us not pass lightly away from this important subject, but add to it the reflection, that this catastrophe was designed to act with peculiar force upon the feelings of the condemned race. It was merciful to terminate as speedily as possible, the sufferings of the animal creation ; but it would not have been merciful to sweep away as speedily those who were soon to enter upon an enlarged sphere of being. It was therefore necessary that the moral sufferings of mankind should be prolonged. They saw from day to day the gradual fulfilling of that scorned prediction which had long been sounding in their ears, and they were taught most fearfully that the place of their

habitation was passing away. But as the Lord is merciful, they had also time to return to him, with weeping and supplication, and with tears; and how know we that thousands of ransomed spirits, did not find forgiveness, and ascend rejoicing from amid the overwhelming waters? Great, therefore, must have been the purpose, and equally so must have been the terrific prelude of a rain that continued during forty days, and of all its horrible accompaniments, which are thus described by the learned Jew Philo, either by inference, or tradition.

“The vast ocean being raised to an height, which it had never before attained, rushed with a sudden inroad upon the continents and islands. The springs, the cataracts, and rivers, confusedly mingling their streams, contributed to elevate the waters. Neither was the air quiet; dense clouds covered the whole heavens, violent hurricanes, with lightnings, and thunders were blended with unintermitting torrents of rain, so that it seemed as if every portion of the earth was being changed into the single element of water; until the fluid mass, composed of falling rain, and swelling waters, covered not only the low lands, but even the summits of the highest mountains. Till every part of the once dry earth sunk beneath the waters, and the perfect system of the world became deformed.”

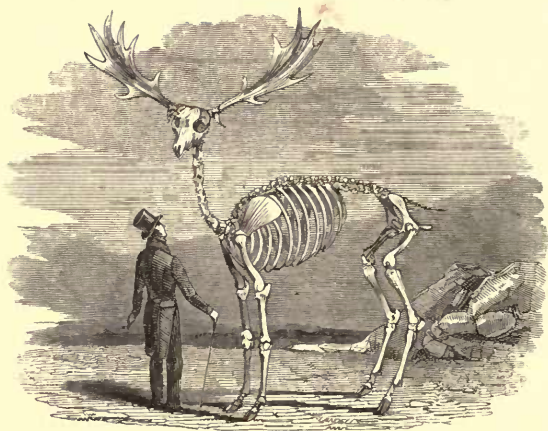
There is still a phenomenon connected with geology, respecting which, it is necessary to offer a few concluding observations, and that is the discovery of the remains of animals, whose species no longer exist. This phenomenon has given rise to much speculation, and has led to the conclusion that the earth was created, not in six days, but in six periods of uncertain duration; and that innumerable animals existing for ages before man was formed, perished in successive catastrophes.

But Newton was at no loss upon the subject; he believed the words of inspiration, that in "six days the Lord made heaven and earth, the sea, and all that in them is." Exodus xx. He believed also, that when the wickedness of man was great, the most High destroyed "them with the earth." Gen. v. 13.

Difficulties undoubtedly there are in accounting for the remains of various non-descript species, for the Mosaic records are brief; they state such important events as it pleased the Most High to reveal to man, but they do not minister to curiosity. Yet, walking by the light of revelation, and merely considering facts as they occur, it may be allowable to offer a few conjectures respecting the extinct species, which seem worthy of attention.

We read that after the lapse of more than ten months, the dove that was sent forth by Noah, returned with an olive-leaf in her bill; and hence he knew that the waters were abated from the earth. It is saying nothing to state, that vegetation quickly succeeded after the deluge. Had the same earth remained, this could not have ensued by virtue of any known law, for the universal lodgment of the sea upon its surface for so long a period, must have extinguished every principle of life, in the roots, or seeds of vegetables. But it was not the same soil on which grass had sprung, and forests lifted their proud heads, on which animals of all descriptions had first walked, and man, sinful man, had forgotten the God who made him. It was a marine surface, on which the seeds of terrestrial vegetation had never yet been sown. The same creative power, must, therefore, have been exercised, as on the third day of creation.

We are told that the summits of the highest mountains only appeared above the waters on the first day of the



CERVUS MEGACEROS.

(Irish Elk;)

In the Museum of the Royal Dublin Society.

Extinct species.

tenth month, and that from these the waters drained gradually during forty days ; that farther, after seven other days an olive-tree appeared, bearing leaves. Grass may spring in a night, and in some humid places, vegetation proceeds with almost incredible rapidity, under the full action of the sunbeams. But the sudden springing up of an olive-tree, cannot be referred to any other cause, than the same divine fiat, which at first commanded, "let the earth bring forth the fruit-tree, yielding fruit;" and which, long afterwards, in pity to the complaining prophet, caused a gourd to spring up during one night, so as to form a shelter, impervious to the ardent beams of an Assyrian sun.

With respect to the animal creation, we are left without any positive data on which to rest ; yet certainly, we have every reason to conclude, that when the Most High made known to Noah, the species, which he designed to preserve, he was pleased to except some from that preservation. The abundant monumental evidence, by which we are surrounded, tends to confirm the supposition ; more than thirty different species of animals have been found bedded in the secondary strata, of which no living specimens are known to exist in any quarter of the globe. The carnivorous elephant, or Mastodon of the Ohio, is one of the most remarkable. Cuvier describes this animal as herbivorous, but surely without reason. We can judge of its nature, only by its remains ; and as the most striking characteristic is found in the enormous grinding teeth, which resemble those of the carnivorous species, there is good reason to believe, that the creature preyed on animal food ; the more especially, as the grinders of the elephant indicate that it is herbivorous.

The mammoth too, which also bears a considerable

resemblance to the elephant, is another of the extinct species. In size it considerably surpasses the largest elephant, and also differs in the form of its tusks and grinders. The fossil remains of this terrific creature are more abundant in Siberia, than in any other part, though met with occasionally in Iceland and in Norway, in Great Britain, and on the continent towards the Arctic Sea.

The remains of enormous reptiles have also been discovered by Mr. Mantell, in the Wolds of Sussex. We owe to him our knowledge of the iquanodon, a terrestrial reptile, approaching closely in form to the iquana of the West Indies, but from seventy to an hundred feet in length. One of the thigh bones measured three feet eight inches : and this, with four vertebræ of the tail, each of which is nearly twenty-four inches in circumference, prove the gigantic size of the animal. The toe-bones of the hind feet are large, and closely resemble those of the hippopotamus ; while the fore-feet or fingers are comparatively slender, like those of the iquana, which requires prehensile feet, from its well known habit of climbing trees. But the monstrous iquanodon would in vain have sought for a tree, on which to suspend his colossal form. The size of the thigh bone leads us to infer, that the thigh itself, when clothed with muscles, and integuments, and covered with scales, must have been as big as the body of a large ox. These singular remains were dug up last year at Maidstone ; other scattered and broken bones had previously been found in Tilgate forest ; but as yet neither the head nor jaw of the terrible iquanodon have been discovered.

A large portion of a different reptile, called by Mr. Mantell, the Hytæosaurus or fossil lizard, has also come to light. One of its most striking characteristics, is a

row of spines, which were probably erect on the back, and realized in this respect those of the fabled dragon of romance.

Surrounded as we are by graceful species of the animal creation, among which the elephant, rhinoceros, and hippopotamus are the only ones that appear to us unwieldy, and colossal, we can scarcely figure to ourselves such enormous animals, with their formidable grinders, or terrific spines. Yet such there were, and these, we have reason to conclude, perished at the era of the deluge.

The Lord commanded Noah to take OF every living thing of all flesh, of fowls, and cattle, and creeping things, and bring them into the ark; of clean beasts by sevens, the male and his female; and of beasts that are not clean by two, the male and his female. "And take unto thee," said the Most High, "OF all food that is eaten, and thou shalt gather it to thee; and it shall be food for thee, and for them." Genesis vi. 19, 20, 21.

Thus evidently selecting, in the command "to take OF every living thing of all flesh," from among the numerous species of animals, and fowls, and creeping things, such as fed on grass, or grain: for instance, OF or among elephants, two of the graminivorous species were taken, and the carnivorous left.

It is certainly not contrary to the Divine Wisdom that certain species should have become extinct, when they had fulfilled the purpose for which they were created. We are sure that those species once existed, but there is no evidence that they exist now; and what more probable cause can be assigned for their extinction, than the universal flood. Strange must it have seemed to the Patriarch and his family, that so many among the animal creation should have been wanting: in some instances, it must

have been a great relief; for what can be imagined more tremendous than an elephant, that preyed on flocks and herds, or than an hideous, carnivorous reptile, one hundred feet in length.

Yet if carnivorous creatures were not admitted within the ark, how is it that lions and tigers, bears and wolves, hyænas and wild cats, are abroad upon the earth? This is a question which cannot be solved; for none of the present generation witnessed the coming forth of the patriarch and his family, with the living creatures whom the Lord inclined to follow him; neither has any one preserved, from generation to generation, the natural history of wild, or domesticated animals. But how know we that those among the carnivora, which now thirst for blood, or act as hideous, yet needful scavengers, in hot countries, were always so inclined? Climate produces a powerful effect both on men and animals. In sultry regions, such animals as hunt for prey are larger and more ferocious, than beneath the temperate or frozen zones, and their ardent nature seems the natural result of a glowing atmosphere, and scorching sun. Hence the lions of Africa and India are the strongest and most formidable of their species. Those of America, if they deserve the name, are like the climate, considerably milder,—and even in the torrid zone, such as inhabit high mountains, where the air is temperate, differ materially from those that reside on the plains. The lions of Mount Atlas, the stupendous ridges of which are covered with snow that never melts, have neither the strength nor ferocity of their terrific brethren on the burning deserts of Biledulgerid, or of Zahara, where the traveller frequently encounters those formidable creatures, which are the scourge and terror of the neighbouring provinces. The hyæna, that gloomy and savage animal, which preys

on the dead, in preference to the living, may be also mentioned as affording a striking instance of change produced by climate. Such as live on Mount Libanus, in Syria; in the North of Asia, and around Algiers, subsist on large succulent bulbous roots, as leeks and onions; while in many parts of Abyssinia, the ferocity of their brethren is very great. The bear, too, affords another instance of the carnivorous propensity being apparently drawn forth by circumstances. When surrounded with plenty, he lives principally on roots and fruits, and will climb the highest trees in search of honey; but when pressed by hunger, he is extremely fierce and ravenous, and amid the icebergs of the farthest north, will attack even armed men.

The carnivora of the present day may, therefore, have been rendered such by various exciting causes, by the effect of climate, or by the facility of obtaining animal food; or it might be, that when the Most High swept from the surface of the earth those terrible creatures, the carnivorous elephant and reptile, with others of a similar description, that he might have replaced them by the present comparatively innoxious race of predatory animals. For what is the strength or rapacity of even the Numidian lion, when compared with that of the *Iguanodon*, one of whose limbs was larger than the body of an ox, and which extended its trailing length more than a hundred feet.

We have shown, that a new vegetable creation must have clothed the bed of the ancient sea, when it was forsaken by the waters: and why should not the same creative power have also produced animals? In concluding, therefore, either that carnivorous propensities were given to, or drawn forth from certain species; or even that new species were created for a specific purpose,

we conjecture nothing at variance with Holy Writ, nor with the deductions of reason. With regard to mankind, it was essential that the whole race should descend from one and the same parent; because the merciful design of the Most High respecting them was founded upon their common relationship to that first parent. "In Adam all die; in Christ shall all be made alive." "He made of one blood all nations of men;" but, since that purpose did not extend to the brute species, we have no reason whatever for supposing it to be indispensably necessary that all the present race of animals should possess an antediluvian origin. And who shall prescribe bounds to the creative power of Him who killeth, and who maketh alive, and who will accomplish his pleasure?

The creation and renovation of this globe, are events, corresponding by various and true analogies, and they are both to be referred to the will of the same Almighty Being. Whether we consider the rebuking of the waters, that covered the earth, as with a mantle, and the calling forth of a vegetable garniture of herbs and flowers; or the annihilation of the human race by the water of the deluge, and the renewing of the earth with trees, and herbs, and flowers, when the flood again subsided; the resemblance between both is so exact, that reason instructs us to employ our knowledge of the former, to guide us to a just apprehension of the latter.

But the extinct species of which we have just spoken are not found in the same strata with those animals, whose species have been preserved. Hence the conclusion is, that they cannot have co-existed, but must have perished in different revolutions. But even this admits of an easy explanation. Suppose that the elephants and elk did not inhabit the same region of the ancient world, and that they

were consequently not congregated together, and admit that they were swept away at different periods of the inundation, they might not have been carried off in similar directions, and deposited in precisely the same spot. Or if some individuals were first deposited, allowing an interval of time sufficient for the agitated waves to cast up, and to accumulate soil above them, then, although they had co-existed, yet some would become bedded in deeper strata than the others, and thus the hypothesis of different revolutions is neither required nor sustained.

One more objection has been urged, and with its consideration we shall dismiss this portion of our subject. It has resulted from the discovery of strata crowded with animal, or vegetable remains even in the midst of the most ancient secondary strata; while amongst the recent strata, or that which is nearest to the surface, the bones of land animals are found under heaps of marine productions. From these an inference has been also drawn, that such remarkable appearances, could have proceeded only from various catastrophes in the earth; that farther, the position of these relics constitutes sufficient evidence of as many surfaces, successively overwhelmed, and consequently that every stratum in which animal exuvæ are found, must have been a permanent upper surface of the globe on which different animals existed.

This opinion is rather ingenious than correct. The character of the phenomena in question plainly betoken a condition of disorder and confusion, yet they are easily explained from the facts of the Mosaic history. We understand that innumerable land animals, pertaining to the ancient world, were precipitated into the sandy or slimy bed of the primitive sea, and were sunk deeply within it, appearing in many instances as if thrust into a lump of

mortar, or inclosed within coatings that had once been fluid. Now if a cause can be found that might, in the same revolution cover the bed, in which those land animals were thus enclosed, with a fresh mass containing marine productions, the whole difficulty will be removed. Need we seek far to find such a cause, when we reflect upon the powerful agency which was in unceasing operation, during the whole period of that turbulent and destructive crisis, producing various alterations, diversified by local circumstances, and reducible to no rule of regularity or order? These being eventually exposed to the observation of man, by the removal of the soil, must be found to retain all the characters of disorder and confusion, which accompanied their formation. And with regard to the finding of fresh-water shells in some of these accumulations, we may remark that the contents of all the river beds must have become absorbed by the sea, and that it is impossible to fix a limit to the transport of those light and buoyant articles in such a state of the ocean. The discovery which has lately been made in Norway of a granite formation resting upon a base of shell limestone, has been brought forward as an argument in favour of more convulsions in our globe, that we are warranted by the Mosaic record in believing. Shell limestone, it has been said, is unquestionably a secondary formation, yet here is granite resting upon it; and therefore it is older, because that which supports, must always be more ancient than that which is supported. Yet one or two mechanical operations are amply sufficient to produce the remarkable phenomenon. If a mass of displaced primitive granite had been so stationed, in the first great revolution of the globe, as to leave recesses under any of its sides; those cavities might, at the period of the flood, have become

entirely filled with either calcareous, or argillaceous deposits; and during the ages which have elapsed since that frightful revolution, these deposits might have become hardened into rock, presenting the appearance of a bed, on which the granite had been more recently formed. We may also add that if any vast dislocations of the rude frame-work of the earth took place during the period of the deluge, which is more than probable, the overthrow and projection of a granite mass, or masses, on the bed of the ancient sea, would produce the same appearance at the present day; and we know that shell limestone constitutes many parts of the Scandinavian peninsula. Thus, extraneous causes were capable of producing this singular effect.

The pressure of such a tremendous mass of waters, as was occasioned by the rain of forty days and forty nights, prevailing fifteen cubits above the highest mountains, and continuing during a period of more than ten months, must necessarily have produced great effects on the surface of the earth. Other changes doubtless took place, from storms and earthquakes, and how know we to what extent? The art of printing, which carries down the remembrance of past events, is comparatively of recent date, and the writers of Greece and Rome, were rather occupied in narrating political occurrences, than in speaking of geologic changes. Throughout the greater part of Europe, men knew not then even how to write their names, and it was not till subjugated by the Romans, that the slightest trace of their history was preserved.

Let us also ever bear in mind that the science of geology is in its infancy, that it has not yet emerged from the dim twilight of past years, that man has penetrated but a little way into the strata of the earth. All that we really know respecting the creation of the world, and the era of the

flood is derived from the record which the Most High has given to his creatures. This must not be impugned at will. It is too sacred to be lightly canvassed. Where the discoveries of modern date, do not harmonize with the facts therein recorded, it becomes us to be silent, and to confess, that we know nothing. As well might man begin to argue that the sun had disappeared from his station in high heaven, when his orb is concealed by the clouds of a November day; as to seek to bend the words of the Most High to suit the ever shifting systems of human science.

PRESENT CONDITION OF THE EARTH.

WE have now to speak of the present condition of the earth, and to point out how well it is adapted to the beings for whose use it is especially designed.

This globe, on which we live, and move,—the school, in which we are trained up for immortality, the great theatre whereon each individual is made a spectacle to men and angels, is surrounded with air and light, and contains the three kingdoms of nature: the earth that forms the outer covering, the vegetable which adorns its surface, and the animal which is sustained by the vegetable.

Mountains and valleys beautifully diversify the scene. How delightful are the views, which we gain, of the subjacent valleys, the rivers, and far distant hills; and again, how pleasant it is to look up from the valleys to those surrounding mountains, which, as Theodoret elegantly remarks, “contain something so august and stately, that the mind is inspired with sublime thoughts in beholding them, and naturally rises from their contemplation, to that Almighty Being, by whom they are created, and sustained.”

And as both hills and valleys, embellish the earth's

surface, so do they answer many important purposes in the economy of nature. The pure air of the elevated regions often renovates enfeebled constitutions, while those, who cannot bear the cold may find a shelter in the green and well screened valleys. Long mountain ranges also keep off the nipping blasts; they reflect the sunbeams, and promote the growth of innumerable plants, which could not thrive on an unvaried surface. Their sides are often covered with different kinds of plants and flowers, the seeds of which have been wafted thither by the wind, and find at different elevations a soil adapted to their growth. These plants serve partly for food and shelter to such animals, as are designed to occupy high windy places; partly for medicine, and partly for the support of man. Mountains and steep hills are framed for other important purposes; they curb the fury of great rivers, they often keep back the raging waves, and are placed like giants for the protection of earth's inhabitants.

High hills, too, are a refuge for the wild goats, and rocks for the conies; they serve as dwelling places, store houses, and citadels for innumerable creatures that could not find a resting place in the valleys, and would be hunted from the plains. The bounding ibex and the chamois, with their numerous relatives, are free to range on them at will; the larger kind of fowls resort to them, and birds that fly along the heavens. Beautiful butterflies are there; and gay-coated insects find in them both food and shelter.

Other necessary ends are answered by these long mountainous ridges, that run throughout the continents; they attract the vapours which in hot countries rise from off the surface of the earth, and which, becoming condensed into water, give rise to innumerable springs, and rivulets that flow down their sides. Such vapours too

as rest upon them, cause the grass to grow, and water abundantly the fields; they drop upon the pastures of the wilderness, and cause the valleys to laugh and sing.

We may also add that the subterraneous treasures of gold and silver, of brass, and stones, and iron, are more easily obtained from the mountains, than when buried under the level ground. Man may sink his shafts deep upon the plains, yet he can hardly extract the mineral, or fossil treasures, that lie beneath; but the way-marks to these treasures are often so obvious on mountain flanks, that the explorer finds it easy to obtain them.

Lastly, as I have just observed, we owe to those high mountains, both gently flowing streamlets, and deep rivers: the streams that flow down their sides often swell into noble rivers, and these bear onward their tributary waters to the ocean. Consequently those vast masses, the Alps, and the Antilles, the Pyrennees, and Andes, the Himmalayas, and the Cordilleras, forming some of the most splendid features in the creation, are admirably arranged, in order to dispense incalculable blessings throughout the habitable globe;—blessings without which many animals could not exist, nor vegetables grow. And further, if the surface of the earth had presented one vast plain, the rivers, instead of rushing onwards in direct channels to the ocean, would most probably have formed extensive marshes. Thus is a threefold purpose effected by Divine Providence, in the mountainous arrangement of the globe. One is, that throughout the earth, with a few exceptions, each country should enjoy the inestimable blessing of water: another, that the surface of the earth, should be so arranged that the parts farthest from the sea, should be generally the highest, for the evident descent of rivers. This again is an admirable design; and is evidently intended for the

commodious outlet of water, for draining large portions of the globe, and for the carrying off superfluous moisture. Another providential arrangement connected with high mountainous ranges, is the benefits which they confer, on such valleys as they encircle and defend. Being naturally drier than the lowlands, they are also provided with greater supplies of moisture: besides the fountains that continually water them, they are more refreshed by dew and rain than the contiguous valleys; they are more frequently covered with fogs, and the clouds often rest upon them. They serve too, as I have just observed, for screens to keep off the cold winds; and the variety of temperature, which they afford, is mercifully adapted for every constitution. Each mountain and high hill answers therefore, several important purposes in the creation, and are most wisely placed for the good of this sublunary world.

Very beautiful is it to observe this exquisite variety of hill and dale, of bold rocks, and ancient mountains. Those mountains, the first creations of the earth, which traverse our continents in various directions, and serve by means of their eternal snows, as reservoirs for feeding the springs, and forming in some measure, the rough framework of the globe. Those primordial mountains which retained their position, and first appeared above the waste of waters, while their rough, unclothed, and broken ridges, presented only a frightful scene of desolation.

Speak we now of rivers, of those swift streams which indent the surface of the earth, and while they flow continually, are as continually renewed. They are all important to the countries through which they pass; they fertilize the soil, and open communications from one inland situation to another; they bear up heavy burthened vessels,

and drive machinery of various kinds. They beautifully vary the earth's surface, and supply to ocean the loss, which is occasioned by daily evaporation.

The Thames, the Danube, and the Volga, the Rhone, and Ganges, the Euphrates, and the Nile, are the most magnificent. These are wonderfully varied, and diffuse both riches and fertility throughout the countries where they flow. We read that the Volga receives in its lengthened course to the ocean, at least two hundred streams, and falls into the Euxine by seventy different mouths; that the Danube bears along with its waters more than sixty rivulets, and pours forth seven streams into the sea. Our own Thames, which rises in the parish of Kemble, Gloucestershire, a little south of the old Roman Road, receives in its progress a number of considerable streams till it swells at length into a noble river.

Thus is Europe well supplied with water; Asia, also; and Africa; and thus are communications opened, from one portion of the globe to another.

Nor less thy world, Columbus, drinks refresh'd
The lavish moisture of the melting year.
Wide o'er thine isles, the branching Oronoque
Rolls a brown deluge; and the native drives
To dwell aloft on life-sufficing trees,
At once his dome, his robe, his food, and arms,
Swell'd by a thousand streams, impetuous hurl'd.
From all the soaring Andes, huge descends
The mighty Orellana. Scarce the Muse
Dares stretch her wing o'er this enormous mass
Of rushing waters;—scarce she dares attempt
The sea-like Plata, to whose dread expanse
Continuous depth, and wondrous length of course,
Our floods are rills. With unabated force,
In silent dignity they sweep along,
And traverse realms unknown, and blooming wilds,
And fruitless deserts, worlds of solitude,
Where the sun smiles, and seasons teem in vain,

Unseen and unenjoy'd. Forsaking these,
O'er peopled plains, they fair diffusive flow,
And many a nation feed, and circle safe
In their soft bosom, many a happy isle,
The seat of blameless Pan, yet undisturb'd
By Christian crimes, and Europe's cruel sons.
Thus pouring on, they proudly seek the deep,
Whose vanquish'd tide, recoiling from the shock,
Yields to the liquid weight of half the globe,
And ocean trembles for his green domain.

Well, indeed, to repeat the words of the poet, "may ocean tremble for his green domain," when the Rio de la Plata, which is larger than the Nile, the Ganges, and the Euphrates united, is ninety miles wide at its mouth, and rushes with such violence into the sea, that the water continues fresh, to the distance of two hundred miles.

Some rivers rise on high windy mountains, others in quiet valleys; some flow through a vast range of wild and romantic regions, others along peopled plains; some hurry impetuously forward, as if actuated by a mighty impulse, and pour their waters with frantic violence into the ocean; others steal calmly and silently on, and never rise above their banks. Many of these appear subservient to certain laws, which are adjusted with a marked reference to the countries through which they pass. Jordan overflows its banks during the time of harvest. The Nile, too, affords one of the most beautiful phenomena connected with this portion of natural history. The gentle rising of the river commences about the 17th of June, and increases during the space of forty days, at which time the cities of Egypt appear like islands in a mighty expanse of water, with here and there a group of noble palm trees. Egypt owes her fertility to these inundations, and very curious is it to observe the causes that operate in producing this effect. When the sun seems to continue stationary

for a few days in the Tropic of Capricorn, and the air becomes highly rarefied, a quantity of vapours is collected from the Atlantic, on the west, and the Indian Ocean on the east; and these, as the sun journeys northward towards the Tropic of Cancer, naturally follow in his rear. By the time this great luminary has arrived at the Zenith, the rain has commenced, and increases. The springs are broken up during April, and as they pour into the Nile, that river again receives the waters of several tributary streams. When June commences, and the sun has passed over Abyssinia, the rivers are quite full, and the heavy rains having swelled those four great streams, of which the Nile is one, they roll onward with accelerated force.

When the sun declines towards the Equator, the effect which he produces in his passage northward is reversed; and, after his arrival at the Line, during the autumnal equinox, his influence ceases on the Abyssinian side, and extends to the southern hemisphere. Thus, on the 25th of September, three days after the equinox, the waters of the Nile generally rise to their highest elevation. The falling of the tropical rains to the extent of sixteen degrees on either side the line, by swelling the streams that flow into the Nile, as well as its own immediate waters, consequently occasions that overflowing of the Egyptian river which Homer so well denominates a river produced and fed by rains. But then, lest the spreading of the waters should extend further, and rise higher than necessity requires, no sooner is the stream seen advancing, beyond a certain point, than immediately a strong easterly wind arises, and keeps it back.

Thus admirably is the earth watered, and here it may be well to consider by what means the beds of the great rivers were first formed.

If a flood of waters was to descend for the first time from a mountainous source, and spread itself along a level country, and increase by means of the waters that continually followed with equal violence and rapidity, what would be the natural consequence? If the first rushing waters found no bed ready to receive them, no channel through which to flow, they would spread themselves in all directions, and roll on in a state of wide and uncontrolled inundation, or rush tumultuously down some steep declivity, to overflow the lower ground. Most assuredly they could not form for themselves a narrow and confined channel, below the level of the plain, and between upright banks. Let any one, for instance, survey the course of the Rhine, and see that majestic river flowing for upwards of thirty miles, from the Seven Mountains, to Cologne, through a vast and level plain, and in a bed, whose uniform breadth appears in the distance like an azure ribbon drawn along that plain, and he will be sensible that the gradual diffusion of even a considerable stream, could not have formed for that river, the deep channel through which it flows. For let us consider, what the bed of a river really is. It is a vast and extensive trench, and we know that in the forming of a trench, considerable labour is required; the soil must be thrown out with care, and the stones removed. But this could not be done by the action of the waters. The Danube, for example, could never have won its way to the Black Sea, a distance of seven hundred leagues, and often through a level country; where the land, on either side the banks, slopes considerably; yet over these the waters are prevented from falling by the restraint of their banks, when without them, the surrounding country would be liable to perpetual inundations.

In tracing the original formation of these river-beds,

and of the valleys, through which they occasionally pass, we must again refer to the era of the deluge. When the waters which had overwhelmed the earth, began to roll towards the place that was assigned them, they must have produced on the soft and yielding earth, effects proportioned to their rapidity and weight. Currents of such mighty power, when driven forward by the wind that was made to pass over them, were fully adequate to furrow the soil, and to excavate the valleys. The winds, therefore, and the currents, produced those undulations on the surface of the earth, which are either gently sloping hollows, or deep valleys, or those deeper channels that form the beds of rivers, which are so turned in many places from the nearest seas, and conducted through extensive inland regions, that it is impossible to contemplate them, without being forcibly struck with the excellency of their arrangement. This is especially discoverable in the Danube, and the Ganges, the Nile, and the Amazon. The direction of all these rivers is determined by the valleys in which they begin to flow. The first formation of those valleys must therefore be ascribed to Him, who sendeth the springs to flow among them, and who by their means, gives drink to every beast of the field. Were it not for this admirable method of irrigating the earth, the whole system of vegetation must necessarily perish.

The varied arrangement of those depressions, which are called valleys, and their connection, both with mountains, and with rivers, can, therefore, only be referred to the one great Cause, from which all things proceed. And it is a blessed thing to refer them to that one "great cause." Every thing shall live, whither the river cometh,* and why, because a channel is cut out for each, and all are collec-

* Ezek. xlvii.

tively directed, where they are most wanted. But if the streams had overflowed, when the waters gushed out, without confinement or direction, many portions of the earth would have perished, either because the rivers could not have extended to them ; or because the unconfined waters would have stagnated, or have pursued the nearest declivities that tended to the sea. Instead of this, God cut out the rivers among the rocks, and sent the springs into the valleys.* He cleft the earth with rivers,† and thus watered its separate portions.

The sea, the sea, the deep proud sea !

What a glorious prospect is afforded by its vast expanse ! How admirably are all things adjusted for the convenience of this world ; what boundaries are set to the wild impetuosity of the billows. At one time high mural rocks forbid their encroachments ; at another, smooth sand is placed for the bound of the sea by a perpetual decree that it cannot pass it, and though the waves thereof toss themselves, yet they cannot prevail ; though they roar, yet can they not pass over it. Jer. v. 22.

Beautiful is it to observe how admirably all things are adjusted ; that the firm earth, and ever moving waters, are so arranged, as to minister in concert. The great oceans, and the smaller seas, are so distributed throughout the globe, as to afford sufficient vapours for the clouds and rain, to temper the cold of regions far distant from the equator, and to mitigate the heat of the torrid zone.

We have every reason to believe that the bason of the sea is composed of the same materials as the surface of the earth, that it has rocks and valleys, high mountains, that bear up from their giant bases, verdant and peopled islands ; immense hollows, and deep caverns. Muddy

* Psalm civ. 10.

† Habak. iii. 9.

and tartareous incrustations, dead sea-weeds, and broken shells, cemented together into a firm mass, or crust, cover large portions of the marine bed ; but wherever these have not been formed, the soil consists of different strata, placed one upon another, and generally parallel to those of the neighbouring rocks, or continents, or islands. We must remember, that while the surface only is disturbed by tides and storms, all beneath is peaceful, and hence it is extremely probable that the bed of ocean has remained for ages undisturbed. On earth, extensive cities frequently take the place of deep primeval forests, fields are tilled and cultivated, where only the wild Indian used to range ; roads are formed over mountains, and canals are led through streamless plains, but in the vast retreats of ocean, man is never to be seen, except when sinking like lead in the deep waters, there to remain, till the sea shall give up her dead.

Doubtless, the beds of different seas vary greatly in their productions, but in all, there is no doubt an exquisite variety of marine substances.

The bason of the Adriatic sea, consists of a mass of whitish marbles, intermixed with other kinds of marble, and covered in some parts with earth of various kinds, with sand and gravel. Donati ascribes to this difference of soil, the singular variety of plants, and marine animals, which he everywhere observed. But one of the objects which most excited his attention, was a kind of marble, consisting of petrified shells, and polypes of earth and sand, and fine gravel. The effect was beautiful, and all around appeared masses of coral, with splendid sea-weeds, and marine vegetables, minerals and metals, pumice stones, and lava. As far too as the eye could reach, were seen mountains, plains, and valleys, with yawning caverns, out of whose deep and inexplorable recesses, came fishes, and

strange looking creatures, such as he had never seen before. Coloured substances were also observed by Marsigli ; some of which were of a brilliant scarlet, purple, and vermilion, others of the deepest yellow, others again, either blue, or green, or of a snowy whiteness. These coloured substances were occasionally incrustated either with shells, or corals, and when brought up, their colours were not merely superficial, but fixed, and permanent, and Marsigli thought, that paints of the finest kind, and greatest value, might be prepared from them.

The materials which compose the entire bed of the sea, may reasonably be conjectured to influence the taste of its waters. It is likewise supposed by the ingenious Boyle, that the saltness of the sea is supplied not only by those rocks, and masses of salt which abound within it, but also from those particles which the streams and rivers dissolve in their ceaseless progress to the ocean. The degree of saltness varies considerably in different parts. This most probably is owing to the various degrees of evaporation, to the quantity of rain, and to the tributary rivers. The saltness of the sea varies also at different depths. Thus it is well known that the Rhone discharges much fresh water into the gulf of Lyons, which being lighter than sea water, will not readily mix with it, and, therefore, the water on the surface being most diluted, it is much fresher than that at a greater depth. Such too is the case in the gulf of Bothnia ; while the waters of our own channel having a communication with the German ocean on one side, and with the Atlantic on the other, and being in consequence subject to a constant agitation, the fresh water, which is poured into it from the Thames and Medway, is so uniformly diffused through all its parts, as to render it equally salt at different depths.

The waters of inland seas also, that have little connexion

with the ocean, and the waters of bays, into which fresh-water rivers empty themselves, contain in general fewer saline particles than the open sea. This is very obvious in the Baltic, while, on the contrary, the Mediterranean sea is more saline than the Adriatic. This excessive saltiness is also tempered in many places by different species of marine plants, which not only serve to freshen it, but also exhale considerable moisture which is borne upwards, and again descends in showers. A fact which is easily proved by putting one of these plants with sea-water, into a long glass vessel, and submitting it to the process of distillation. A clear sweet water will presently begin to distil into the receiver, though the plant itself is so impregnated with salt as to be unpleasant. The portion of pure water that can be thus obtained is small; but it is evident that on the vast extent of ocean an immense quantity of sea-water is every hour made fresh, and raised up into the air from the number of marine plants, which are either left uncovered by the tide, or lift their heads above the waves.

Sea-water, when taken up at a considerable distance from the shore, is colourless and transparent, and free from any kind of scent, but its taste is strongly saline and bitter. The specific gravity of this widely diffused compound, varies in different latitudes and circumstances, and is less within the Polar circles, than at the tropics: a peculiarity which doubtless results from the quantity of ice that abounds in those regions.

We may briefly notice that sea-water is composed of various ingredients, of common marine or culinary salt, compounded of fossil alkali, or soda, and marine acid, magnesian earth, and a small quantity of selenite.

In treating of the beautiful construction of our rolling planet, we have spoken of the winds, as ministering to the health of its inhabitants, but it is on the wide ocean, that

their influence is most sensibly felt. There blow the trade winds, the easterly, near the coast of Guinea, and the periodical westerly monsoons under the equator in the Indian seas.

We have also, in some countries, a breeze that blows alternately from the sea and land during certain hours of the night and day. This welcome breeze is commonly felt in the morning about nine. At first it proceeds slowly in a fine black curl upon the water, which increases gradually till twelve, and then dies away about five. When it ceases, a contrary breeze springs up, which increases in freshness till midnight, and is again succeeded in the morning by the former breeze.

In countries where the land-breeze is wanting, as for instance the Brazils, and many of the Caribbee islands, its absence is compensated for, by a general or easterly wind, that blows from one end of the country to the other, and serves instead of a land-breeze. In other portions of the globe which are not refreshed by sea-breezes, a general wind answers the purpose. This is very obvious on the western coast between the tropics.

Thus beautifully has a nameless poet referred to the refreshing night-breeze; one, perhaps, to whom that breeze, recalled, as it passed across his fevered brow, the thought of home, and friends, and those green pleasant fields, where he had first gathered the cowslip and the primrose, in the sweet fresh gales of spring.

Spirit that breathest through my lattice, thou
That coolest the twilight of the sultry day,
Gratefully blows the freshness round my brow;
Thou hast been out upon the deep at play.
Riding all day, the wild blue waves till now
Roughening their crests, and scattering high their spray,
And swelling the white sail. I welcome thee
To the scorch'd land, thou wanderer of the sea.

Nor I alone,—a thousand bosoms round
Inhale thee in the fulness of delight,
And languid forms rise up, and pulses bound,
Livelier, at coming of the wind of night.
And, languishing to hear the grateful sound,
Lies the vast inland stretch'd beyond the sight.
Go forth, into the gathering shade—go forth,
God's blessing breath'd upon the fainting earth.

Go rock the little wood-bird in his nest,
Curl the still waters, bright with stars, and rouse
The wide old wood from his majestic rest—
Summoning from the innumerable boughs,
The strange deep harmonies that haunt his breast.
Pleasant shall be thy way, where meekly bows
The shutting flower, and darkling waters pass
Between the overshadowing branches, and the grass.

The faint old man shall lean his silver head
To feel thee; thou shalt kiss the child asleep,
And dry the moistened curls that overspread
His temples, while his breathing grows more deep;
And they who stand around the sick man's bed,
Shall joy to listen to thy distant sweep,
And softly part his curtain to allow,
Thy visit grateful to his burning brow.

Emblem of one who owns no earthly change,
Whose hand in all things seen shall soon restore,
With sounds and scents from all thy mighty range,
Thee to thy birth place of the deep, once more.
Sweet odours in the sea-air, sweet and strange,
Shall tell the home-sick mariner of the shore,
And listening to thy murmurs, he shall deem,
He hears the rustling leaf, and running stream.

Equally pleasurable in their different modifications, and useful, are those winds which now howl fiercely through our woods, and again breathe in the breath of spring. Were it not for their active ministry, the circumambient fluid, the atmosphere, which encircles our globe, and now

so greatly conduces to our health, would become unfit for respiration; but the perpetual agitation which they produce, renders it both pure and healthful.

Neither are these agitations beneficial only to the health; they add greatly to the pleasure of mankind. Witness the gales that fan us during the heat of summer, without which the hay-maker could hardly ply his pleasant labour; or the harvestman collect his grain; witness the breezes which come loaded with fragrance across our plains; but especially the perpetual gales that refresh the torrid zone, and render its otherwise intolerable regions a fit habitation for men and animals.

Beautifully is the earth arranged, but all its splendid garniture would be unavailing for the use of man, without an atmosphere, that subtile fluid, which extends around this sublunary globe. By it all creatures move, in it the clouds are upheld, and through its penetrating energy, the whole vegetable kingdom springs into life and freshness. Thus necessary is the atmosphere to life, and, no less useful is it for the conveyance of innumerable living creatures. The winged tribes owe to it their flight and buoyancy, and sounds are conveyed by its medium. It reflects to us the light of the heavenly bodies, and refracts the sun-beams to our eye, before his orb appears above the horizon, and after it has set, by which means we enjoy a longer day, and the cheerless nights of the frigid zone are shortened to the inhabitants.

Light, how pleasant it is; how necessary to the happiness of all created things! Without this beautiful emblem of its Creator, this pure influence flowing from the glory of the Almighty, this unspotted mirror of his goodness, what would the world become? But, by the aid of this admirable, this first-given, because most necessary part of

the creation, man, and the inferior animals can properly fill up their allotted station in the universe. Those whom he made in his own image, and placed here as spectators of his works, can behold the wonders which he has made : they can view the glories of the heavens, and contemplate the beauties of the fields, the gay attire of the feathered, and the exquisite garniture of the insect tribes; they can view extensive prospects and undertake distant journeys. Man by the aid of this important medium, may behold the harmony of this lower world, the majesty of the heavens above, and the exquisite workmanship of God in every creature.

We may also notice as especially subservient to the benefit of man, the astonishing velocity of this subtile agent, its swiftness being nearly two hundred thousand English miles in a second of time ; and also that wonderful expansion which causes it to fill all things by reason of its brightness, and instantaneously to chase away the deepest gloom. Throw open the doors of a deep dungeon in which darkness has long brooded, and how pure and gladdening is the effect of light ! There is no chamber so gloomy, that it cannot penetrate, when the intervening barrier is removed.

Tides, too ! how wonderful they are, how well regulated, how admirably subservient to laws which admit of no variation. He who visits the sea-coast will observe that the mighty waters flow onward to the shore during certain hours from south to north : now gradually subsiding upon the sand, now rushing forward with terrible velocity, and wearing away the firmest rocks by their incessant toiling ; now pouring into the mouths of rivers, and then receding with a bound. This continues about six hours. After

which time all is comparatively still for nearly a quarter of an hour. One might almost fancy, that a voice was lifted up above the ocean's roar, commanding that her billows should return, and leave behind them the rich deposits, which they brought up from her remotest depths—silently the mandate is obeyed, and for about six hours the waters gradually retire. Again a seeming pause ensues, and again fresh billows roll towards the shore. Thus does the ocean ebb twice a-day, and flow as often but not at the same hours. When the moon is new; and when it is full, that is, in the first and third quarters, the tides are high and swift; when, on the contrary, she verges to the second, and the last quarters, the tides are slower, and less deep. All that we require for the solution of this beautiful phenomenon, is simply the attractive power of the earth and moon, and hence that mighty ocean which covers more than half the globe, is found to be in continual motion, alternately ebbing and flowing, without the least intermission. There is also a flux and reflux at the same time in the two opposite portions of the globe, so that when our antipodes have high water, we have the same.

Currents, are also very important to navigators, those progressive movements of the ocean, which carry any floating substances swiftly onwards by means of their own velocity, and that without the aid of either winds or tide! Their breadths and depth, and velocities are equally various and fluctuating. Some, for instance, flow swiftly to a great distance, and spread a great way, while others are observed close to some particular coast or strait, and not farther; some reach deep, and others are very superficial. But the mightiest current with which we are

acquainted in the world of waters, is from east to west. This current flows from the Pacific and the Indian ocean, round the Cape of Good Hope, along the coast of Africa; it then passes to America, where it divides itself into two branches, one of which flows southward, towards the coasts of the Brazils, and the other northward into the Gulf stream, which proceeds round the Mexican gulf, and advances north-eastward, in the vicinity of Newfoundland, after which it probably returns eastward, and south-eastward, crossing the Atlantic once more.

The whole expanse of ocean is consequently put in motion, independent of either tide or wind, and as the waters advance westward, their motion becomes accelerated, and after having traversed the globe, they rush impetuously on the eastern coast of the Great Atlantic. This motion is most probably owing to the diurnal motion of the earth, on its axis, which is in a direction contrary to the motion of the sea.

Thus admirably are all things adapted to answer the most important purposes. Thus is the restless ocean swept over by strong winds. These include the general and coasting trade-winds, the sea, and the land breezes,—the one serving to carry the mariner in long voyages from east to west, the other to waft him to particular places; the one impelling him to his desired haven, the other carrying him swiftly out. Tides and currents preserve the waters from becoming stagnant, and bear off with them such extraneous substances as might otherwise pollute the air. They also convey a great variety of seeds to the most remote places. Sir Hans Sloane mentions four different kinds, which are frequently thrown by the sea, on the northern parts of Scotland, where they arrive either

in large companies, or as solitary colonists, which come to seek for settlements in countries very distant from their own. They are natives of the West Indies, and are no doubt brought by the gulf-stream.

These vegetable fleets emigrate from every part of the known world ; —

No star have they to guide their course,
Or Tyrian cynosure,

or even a pilot to steer them over the pathless ocean ; yet still they voyage on, impelled by the currents, and the united efforts of the winds and waves, till they arrive at the places of destination. Linnæus tells us, that the most striking proofs are continually presented in Lapland, of the great assistance which the sea and rivers afford in depositing the seeds of plants. That distinguished naturalist frequently observed Alpine productions growing upon the sea-side, at the distance of thirty-six miles from their native mountains : he also remarked the *centaurea caleitrapa*, or star-knapweed, a native of Germany, on the coast of Sweden.

The sargossa, which grows on the rocks about Jamaica, is often carried by the currents towards the coast of Florida, and thence into the North American Ocean, where it lies thick on the surface of the sea. The fruits of the American cassia is thrown annually on the coast of Norway, and frequently in so recent a state, as to vegetate, when properly taken care of. Such are the double cocoas of the Molucca islands, which the sea carries annually to the distance of some hundred leagues, and lands on the coast of Malabar. Ripe and fresh seeds from the West Indies are sometimes thrown on the coast of Norway. Those of Spain

and France are found on the shores of Britain and Africa, and Asiatic plants on those of Italy.

Wherever a traveller is able to compare the original growth of trees and shrubs, with the sites they occupy on the sea-coast, he uniformly discovers that their seeds are admirably constructed for floating on the water; that while some few seeds are contained in capsules, resembling bottles, as those of the great gourd; others are incrustated with a coat of wax, which enables them to float, as the berries of the flax-tree, or royal pimento of Louisiana; that whilst a few are coupled together as double cocoanuts, and perform their voyages, like the canoes of the South Sea islanders, many are inclosed in a kind of bony shoes, that are notched on the under-side, and covered over on the upper with a piece resembling a ship's hatch. These may almost literally be called shoes of speed and silence; for they pass over the surface of the billows, and journey on by day and night, amid the raging of the ocean, where no human foot would dare to follow them.

We might enlarge further on this subject, and mention the delight of standing on our favourite North Devon coast, when the wind gently ripples the surface of the sea, and high forest trees, as at Clovelly, dip their pendent branches to the water's edge.—We might with pleasure describe the seeds of different plants, launching one after the other, and sailing away to distant parts. But enough has been already said, to shew how wonderfully tides and currents conduce to various important purposes, and how they act in concert with the winds.

Surely there is not, throughout the whole extent of human observation, a more imposing spectacle than the ocean;—one more adapted to raise our thoughts to the Great Author of the Universe. Its profound depth and

ceaseless roar,—its immense extent and ever changing surface,—the myriads that move beneath, which God has made to play therein, all conspire to fill the mind with awe and veneration. That great expanse is the mighty reservoir of nature, the source which enriches the earth with fertility and verdure. Fountains, and rivulets and flowing streams, even summer clouds and vapours, hail, and rain, are all indebted to its ever-moving waters, for their actual being, and the blessings they invariably confer.

Evaporation is the irresistible, though secret power, which produces the effect. Were this to cease, ocean would in many places soon overflow its banks, and occasion a fearful inundation. Neither rain nor dew could refresh the thirsty soil, the vegetable world must fail, and the cattle be deprived of their usual food. Instead of those summer clouds and gentle showers, which refresh and fertilize the soil, the heavens would present an unvaried appearance, and the sun would pour down his unmitigated beams. But, by means of evaporation, an equilibrium is every where preserved; and how great that evaporation is, may be readily understood, when we consider its effects. Let us take the Mediterranean for example.—The Nile, with the rivers of Italy, and such as flow into the Gulf of Venice, pour their tributary waters into this great inland ocean. Yet notwithstanding the mighty influx, the Mediterranean does not increase in size, though a constant current also sets in from the Atlantic, through the Straits of Gibraltar. This extraordinary fact clearly evinces the astonishing power of evaporation. From the surface of the Mediterranean, which covers seven hundred and sixty-two square miles, five thousand, two hundred, and eighty millions of tons are raised every day, by means

of evaporation; while the rivers that flow into it yield on an average only one thousand, eight hundred, and twenty-seven millions of tons. It therefore follows, that nearly three times the quantity of water that pours into this inland ocean, is raised from it by evaporation. But how is the return made? By a three-fold operation. One part descends again into the sea, another falls on the low lands, and the plains and valleys, to refresh the grass and shrubs; a third supplies the sources, and swells the currents of innumerable streams or rivers, that carry back again to the ocean those supplies which it has so abundantly afforded.

Thus wonderfully do the ocean and the rivers, the sun and the atmosphere, act in concert, to preserve the balance of nature. Particles of water are rapidly drawn up by the sunbeams into the surrounding atmosphere, from the surface of the deep, and float as clouds or vapours above our heads, through the regions of mid air; now appearing as summer clouds, beautifully tinged with various colours; now sailing majestically, and bearing the thunders as their artillery; now condensed into water on the tops or sides of those vast chains of mountains, that attract them in their course, and down the declivities of which they glide as streams, which, after receiving many others, either fertilize the valleys, or become a river, that bears onward its tributary waters to the ocean.

It is beautiful to observe the harmony that subsists in nature. How all things act in concert; and each is subservient to the will of Him who made them! This is obvious in the natural world. Happy would it be for us if it were equally so in the moral! But in this, almost all

is wrong. There is no love and unity. Men tear and devour one another: the most sacred ties are often ruptured. Unhallowed tempers break up the peace of families, and ruthless war desolates the fairest portions of the globe. Religion can alone shed a blessed influence upon the scene, and this influence often appears embodied, amid the hideous chaos, as some beautiful flowers on a time-dismantled ruin. But it will not be always so; and we look for new heavens, and a new earth, wherein dwelleth righteousness, when nation shall no longer lift up a sword against nation, neither shall they learn war any more.

This earth, undoubtedly, received its final impress upon the receding of the waters of the deluge. Then it was that the great rivers, of which we have just spoken, flowed on, in their respective channels, towards the ocean; then were the continents brought to light, and the islands left uncovered by the waves. Changes, undoubtedly, have taken place since; from some parts, the sea has gradually receded; upon others it has gained: islands have been formed by the labours of the coral insects, and extensive tracts have either disappeared, or undergone tremendous changes, from the effects of volcanic fire; but the characteristic features of the earth's surface are most probably the same as they appeared, when the waters were gathered together in one place, after the hideous catastrophe of the deluge.

We now pass on to notice some of those remarkable arrangements in the habitable globe, which clearly indicate the goodness of their Creator.

Let us observe for instance, the peculiarities of Norway, with respect to soil and element. Norway is a wild country, abounding with pine-forests; yet in many parts it is so inaccessible from the coast, as to preclude the pos-

sibility of conveying timber, by the ordinary method of land-carriage to the sea. Yet this timber is an important article of commerce, necessary to mankind, in various parts of the world, and serving also an important purpose, to the inhabitants of many cold and woodless countries.

Here then is a difficulty to be obviated, and how is this effected ?

The bold shores of Norway are magnificent, and imposing. High and stupendous rocks present a barrier to the ocean, and these are washed by a sea, generally from one to three hundred fathoms deep. Numerous creeks, or rather water-courses run far back into the country, and look as if they had been worn away in the lapse of years. The traveller who explores in summer, the deep beds of these extraordinary ravines, observes that they are strewed with large blocks of stone from the summit of the mural rocks that tower on either side, or with pebbles and fragments of wood, which the hurricanes have swept from distant heights.

The most casual observer must conjecture that these extraordinary ravines have been worn away in the lapse of ages ; but the geologist, not contented with the mere observance of the fact, will refer it to the silent operations of two important agents.

That change of temperature, which is so peculiarly obvious in the northern regions of the globe, may be noticed as one great cause of the slow destruction that is discernible in some of its most durable and solid portions, where abrupt and rugged outlines record the devastations which time has produced. The second, an agent nearly irresistible, is the gigantic power, with which water, in becoming ice, opposes every obstacle to its expansion. Those fissures, which have occurred from the effect of frost,

or time, between the blocks and masses of the precipitous rocks, have been filled with water either from the trickling of melted snow, or from a streamlet flowing over them; this water, when in the act of freezing, expands, so as to occasion a crack in the stone, and often entirely separates two contiguous pieces. The pieces of the stone become thus open to the attacks of weather, and in the course of time, either fall into the valleys, or are hurled by some sweeping wind into the ocean. When the materials are friable, and yielding, the change is proportionably rapid, and the influence of weather upon mountain slate is often such as to produce large heaps of fragments. Another winter, the same operations are renewed, while the masses of stone, thus loosened, become new and powerful instruments for effecting an important purpose. They roll down the precipices, wearing away the surface, over which they pass, and often form a part of the mighty artillery with which old ocean assails the bulwarks of the land: they are also frequently impelled against the parent rocks, from which they break off other fragments, and thus by three resistless agents, a great purpose is effected in the economy of nature.

It is by operations of this kind, not indeed performed in a few years, but during the lapse of ages, that passages have been worn in the firm rocks of Norway so deeply indented, and carved out, that the furious torrents which often find in them a passage to the ocean, seem to have cut out their own beds. The passages are called in the language of the country, *Derbentes*, and into most of them rush impetuous rivers, or rather torrents from the interior, unfit indeed for navigation, but singularly useful for the conveyance of timber, that great article of Norwegian commerce, from otherwise inaccessible forests. These

trees, destined for various important purposes, are cut down by the inland peasantry, and conveyed to the edge of the high rocks, which rise like walls on either side of their time-worn channels, into which they are precipitated, and then swiftly hurried on, until they arrive at the barriers, that are placed obliquely in the channels to impede their progress. To these the owners of the timber resort, and on paying a certain rate to the proprietor of the barriers, they receive from him their pieces, which are all marked, previous to their being committed to the waters.

Another important purpose is answered by these *Derbentes*. Early in the spring, and at the breaking-up of the ice, floods of melted snow, sweep over the country, and often uproot in their progress, the largest trees. These trees, which grow near the *Derbentes*, are consequently hurried into them by the fury of the wind, and are then carried irresistibly on by the Norwegian floods, till they are deposited on distant shores. Large trees intended as articles of commerce, with innumerable staves, also frequently escape from the barriers of which we have just spoken, when at the breaking-up of the ice, or after heavy rains, the torrents are more than usually swelled.

To these and similar causes, operating equally in different parts of the northern regions, Spitsbergen, Greenland, Davies' Strait, the shores of Hudson Bay, and the coast of Nova Zembla, are annually indebted for large quantities of drift wood. Greenland is principally furnished from the banks of the Obey; perhaps, also from other great rivers, that flow into the frozen ocean.

Along their woodless shores old timber, or drift wood, fir-trees, seventy feet in length, either uprooted, or fresh from the axe, or cut into lengths of three yards, may be seen heaped together, eighteen, or nineteen feet above the

level of the sea, intermingled with pipe-staves, and wood fashioned for use.

All these are borne on the currents of the northern ocean, from those thickly wooded regions in still higher latitudes, which are often visited by fierce winds, or furious tornadoes.

Now look to Lapland, and observe the compensations that abound in that wild land of mountains, and of deserts, of forests, fens, and lakes.

During winter the sun never rises in the more northern parts, for at least three months, but this privation is mitigated by a constant revolution of dawn and twilight, by a serene sky, and bright moonlight, and by those dancing meteors, and brilliant corruscations that shoot along the heavens. The weather is then so intensely cold, that spirits often freeze within the houses, and if the door of a warm room is opened, the external air will frequently convert the vapour within to a kind of snow, and whirl it round in vortexes. Those who go abroad often feel as if the cold would suffocate them: and within doors, the cracking of the wood, of which the houses are built, continually warns them by its contraction of an increase of cold. Maupertuis, who was sent out by the French government to ascertain the real figure of the earth, thus spoke of this severe and rigorous country. He also mentioned the effulgent corruscations of the aurora borealis, the dancing meteors, and the bright clear moonshine, that gladdened the long cheerless months of comparative darkness, during which the sun was never seen to rise above the horizon. And how brilliant are the "merry dancers," as the northern lights are often called. At first a light yellow tint on the horizon, announces their approach; then streams of light shoot up, towards the zenith,

and at length over the whole hemisphere. Their movements are inconceivably swift, and they continually astonish the spectator, with their rapid changes. At one moment they break out in places where they were not seen before, and render visible the frozen Alps, or Alps of snow, as they are termed; the stupendous mountains, and the frightful rocks, the deep solitary valleys, and the frozen lakes, the vast pine forests and snowy plains, on which the villages of the natives are seen at intervals. All these are rendered instantaneously visible. One might almost fancy, that an obscuring mantle was suddenly removed by some magic hand; but while the eye dwells with astonishment on the wonders of the scene: in a moment all is gone. Darkness succeeds. Then again the lights are seen to skim briskly along the heavens, again the mighty landscape is unveiled: again all is darkness.

Gmelen relates that he once beheld a most magnificent spectacle of this kind, in the northern parts of Siberia. Single pillars of great brightness appeared as if based on the horizon, which gradually increased in size and splendour, and remained stationary for a short time; till on a sudden they rushed from place to place, with incredible velocity, and finally covered the whole sky as if a magnificent tent had been suddenly expanded, all glittering with gold and gems, with rubies and sapphires. A more beautiful, and yet more awful spectacle could scarcely be imagined. And it sometimes happens that the phenomenon is attended with a cracking and rushing noise, as if the largest fireworks were playing off. When this occurs, the natives are accustomed to say that the "raging host is passing by." Hunters who pursue the blue and white foxes on the confines of the Icy Sea, are often surprised in the midst of their course by these northern lights. Their dogs are then

so much frightened, that they refuse to proceed, and throwing themselves upon the ground, remain quiet, till the noise has passed.

This wonderful phenomenon, however terrible it may appear to those, who witness it for the first time, beautifully illuminates the dark sky of the northern regions, and enables the inhabitants to fish and hunt, and to proceed with their ordinary occupations. The constant revolution of dawn and twilight, the serene sky, and brilliant constellations, the cloudless moon, and its reflection on the dazzling surface of the snow, compensate in a great degree for the absence of the sun. The natives can then take long journeys, and their rapid sledges, guided by these wondrous lights, are often seen to speed with inconceivable rapidity, over the hard impenetrable surface of the frozen snow.

The open country abounds with elks, and beavers, with otters, and wild game of every description, and the forests with beautiful martins, and fine squirrels. There are also ermines and sables; large cats attend the Laplanders in hunting; and little dogs trained to the pursuit of game. The woods and mountains swarm with wild fowl, numerous aquatic birds resort to them from the German Ocean, and lapwings follow in such crowds as to darken the air. The rivers, too, abound with salmon, that ascend from the gulf of Bothnia, and several migratory species resort annually to the shores.

Such are the riches of Lapland, and they mercifully compensate for the deficiencies of soil and climate, as the country is not adapted to purposes of agriculture. True it is, that the short summers are delightful, that nothing then can be more enchanting than the prospects of vast mountains, forests, lakes, and rivers. Roses are seen to bloom in all their fragrance and beauty, beside the stream-

lets that leap sparkling into life. Various kinds of wild fruits, the currant, and the mulberry, the raspberry, and bilberry, grow there in great profusion; the woods are varied with birch and pine, with the service-tree, and willow, the poplar and the cornel. Yet still the difficulty of preserving sheep and cattle through the winter, prevents the natives from rearing them, and they depend upon the reindeer as a substitute for all that our more favoured climate affords. I shall not now speak further of this interesting country except to state that the angelica, and sorrel, are specifics for most of the disorders to which the Laplanders are subject, and that very beautiful it is to see how the plains are carpeted with heath, and fern, and moss; how in one place a pale yellow lichen decks the earth with its gay verdure; in another a hoary moss seems to mimic the winter snow. The former grows in a shape nearly octagonal, and approaching to a circle, and as the circles join each other, they form a kind of mosaic work. As this moss is very dry, nothing can be more pleasant to tread upon, nor can there be anything softer for a bed. In short, said Acerbi, and his companions, who often slept upon it in their journey, this moss seemed to be a royal plant, which ruled over the vegetable kingdom, in those cold regions of the globe, and also distributed its bounty, and its influence among a peculiar race of animals and men.

How wonderfully then is that stern country rendered habitable; how admirably is the darkness tempered by those welcome meteors, which shoot across the heavens with such effulgent brightness. Without the light they afford, the natives could not carry on their occupations; they could neither fish, nor hunt, nor take distant journeys, but

buried three long months in their Cimmerian dwelling, they would be compelled to forego all the pleasant occupations of active life.

The Most High has mercifully gladdened their condition, while, for reasons inscrutable to us, he has placed them amid the wonders and privations of the Arctic regions. Yet still so much of happiness is blended with their state, and so far are they removed from the temptations of polished life, that no other portion of the globe can, perhaps, exhibit an happier, or more innocent race of people.

Other instances might be adduced of admirable fitness, but these shall suffice. The whole creation amply testifies to the Beneficence of that Almighty Being, at whose commanding word, it first emerged to life and beauty. Who said, "Let there be light, and there was light."

One thousand millions of human beings are conjectured to exist upon this revolving planet. But who can number the quadrupeds and birds, the fishes that pass along the paths of the great waters, and the insect population that inhabit every leaf and open flower. Examine a map of the world. There are the Alps, and the Riphæan hills, and Caucasus, and the magnificent sweep of the Andes. There are the Cordilleras and the high hills of Tartary, and China. Yonder are the snow-clad mountains of the frozen regions, and beneath them rolls the Arctic sea. Lower down is Iceland, the cultivated fields of Britain, civilized Europe, and burning Africa, the vast continent of America, stretching from north to south, the smiling plains of Mexico, Peru, and Chili; turbaned India, and all the glory and luxuriance of the East. Look again, but with the mental eye, for the visual organ can no longer follow it: dissimilar races of men are conspicuous in various por-

tions of the globe. One part is crowded with fair men, in another are seen clear olive faces, in another black. Some are swarthy, others of pale complexions. Their languages are various, and their modes of thinking widely different. Each continent, and every large island, has also its own peculiar kinds of quadrupeds, and birds, and insects. The lordly lion, the boar, the antelope, the wild byson, the tusked elephant, the reindeer, the wolf, the bear, and arctic fox, have all their boundaries assigned them. The air is filled with a winged population. The lakes and ponds, every sea and river is stocked with fish and animated beings, of strange forms and aspects. Myriads of insects, and creeping things innumerable are seen walking in the green savannah, to them forests of interminable length, and among the branched moss that clothes the roots and branches of high trees. And more than even these, every leaf that quivers in the sunbeam, and every flower that drinks the dew of heaven, is in itself a world of animated life.

Over the mighty whole, watches One who never slumbers, and whose ear is ever open to the prayers of his children. He is our Father, his eye is perpetually upon us, the darkness of the night cannot hide from him, he spieth out all our ways. He will not overlook us in the thronged city; nor need we fear to be forgotten in the most solitary place.

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